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THE dangers of natural gas fuel have been strikingly illustrated lately, by three severe explosions in a single day, resulting in the demolition of two houses, and the fatal burning of one or two persons. The gas obtained from the wells in the Pittsburgh region issues from the earth under great pressure, so that it is not easily confined in pipes, and it has the additional quality of being nearly inodorous, so that its escape is not so quickly detected as in the case of coal gas, and a leak is very likely to lead to a dangerous accumulation of the explosive mixture which it forms when diffused in ten or twelve times its bulk of air. In the first case reported, the occupants of a house in which the natural gas was used as fuel were awakened by a smell like burning paint. Two persons went together to the basement to see what the matter was, taking a lamp with them. Nothing seems to have attracted their attention, until the one carrying the lamp raised it above her head, when the accumulated mixture of gas and air at the top of the room exploded, burning them both in a shocking manner, and blowing out the front of the house. There was in this case no reason to suppose that the gas escaped through the house pipes, but a leak was discovered in the street main, the gas from which is supposed to have forced its way through the ground beside the service-pipe, and so into the house. In the second case there were no gas-pipes in the house, and the nearest street main was thirty-five feet away; but it is tolerably certain that gas must have escaped from the street-pipe, and have found a passage through the earth and the foundation wall into the cellar, where it accumulated under the ceiling, a little of it working upward through the crevices of the floor. The small stream escaping about the hearth of a fireplace in the first story took fire, burning with a blue flame which attracted the attention of one of the young ladies of the family, who called her brother. He, very naturally, proceeded to the cellar with a lamp to investigate the phenomenon, but as soon as the cellar door was opened a violent explosion took place, completely destroying the house, which was of brick, and burying all the inmates in the ruins, fortunately without fatal injury to any of them. Of the third case, which occurred in Pittsburgh, the accounts are very meagre, but it seems to have resulted in the demolition of a store, and in damage to property in the neighborhood. As some of the wells produce enormous volumes of gas, one, we believe, delivering something like ten million cubic feet a day, their capacity for doing mischief unless the flow is properly controlled is almost unlimited, and as at least one-half of the serious gas-explosions in cities are traced to gas from leaky street mains, finding its way through brick or stone work into cellars or sewers, it is very desirable that the conduits for conveying natural gas, particularly when under its original tension, of one or two hundred pounds to the square inch, should be made secure beyond a doubt by rigid inspection.

A CURIOUS illustration of the importance of remembering the expansion of metals under heat is found in a story told in the *Scientific American*. It seems that a new railway, connected with the Midland system, was recently opened for business in England. The track was laid in the winter, and the engineer seems to have forgotten that steel rails would expand in warmer weather, or else to have supposed that the coëfficient of expansion, less than one one-hundred-thousandth of their length for each Fahrenheit degree of temperature, was too small to be appreciable; so he laid the ends of the rails nearly together. In consequence of this oversight, when summer arrived the track began to move. The ends of the rails were forced together by the expansion, and as they could move no further in the direction of their length, they were obliged to give way laterally, and the track spread in this way so seriously as to prevent its use, and the whole business of the road was suspended until the rails could be taken up and relaid with a proper interval between them. For architects, the effects of expansion by heat are perhaps more commonly to be observed in steam-pipes than anywhere else, and careful provision must be made for this in many cases. We saw, not long ago, an exhaust-pipe led into a ventilating-flue, near the top. The ventilating-flue was of galvanized-iron, and a long opening had been made in the side, fitted with a door sliding vertically, the exhaust-pipe passing through the middle of the door. The value of this arrangement was shown on turning steam into the pipe, which expanded in a few minutes so much as to lift the upper end, and with it the sliding-door, two and five-eighths inches. If the pipe had been inserted without precaution in a brick flue, as might readily happen if the architect or builder were careless, the first admission of steam into it would probably have pitched the chimney into the street.

A RATHER barefaced deception is said to have been practised of late by certain English dealers in metals, in selling large quantities of steel made by the Bessemer or similar processes as "cast steel." Although Bessemer steel is literally cast in ingots on removal from the converter, the name of "cast steel" has always been understood in the trade to mean crucible cast steel, which is made either by melting the best blistered steel in a covered crucible, or by melting pure iron, and carbonizing it with charcoal. However made, crucible cast steel is the best and most costly form of carbonized iron, and sells ordinarily at about ten times the price of Bessemer steel, so that whatever may be the merit of Bessemer steel as now manufactured, its sale under cover of a name appropriated to a far more valuable product is a disgraceful fraud. The first public intimation that such tricks were practised in the trade seems to have come from Dr. Webster, who was for many years Consul for the United States at Sheffield, and has recently written an official report on the manufacture of steel; but some confirmation of his accusation is to be found in the fact that after the matter was called to the attention of the British Iron and Steel Institute, the Sheffield manufacturers refused to allow their establishments to be inspected, and caused the annual meeting of the Institute, which the members wished to have held there, to be transferred to a distant place.

THE *Scientific American* gives a very clever imaginary picture of Captain Eads's Tehuantepec ship-railway, accompanying it with a good deal of interesting information about the details of the scheme. Most persons know something of the general features of the railway, which is intended to consist of three parallel tracks, over which three double engines, pulling together, are to draw a huge cradle, containing the vessel which may need transportation, from the Atlantic to the Pacific. After a ship is fairly balanced on the cradle, and supported by the shores which can be placed in all directions about it, there seems to be no reason why it cannot be dragged a hundred and thirty-four miles over moderately easy grades, but the placing of a floating shell, loaded with three or four thousand tons of cargo, on the cradle, is a delicate matter, and the most ingenious part of the scheme is the lifting pontoon by which the transfer is effected. In substance, this consists of a forest of hydraulic rams, which are submerged in the water of the dock as the vessel to be treated enters it. The rams are attached to a huge cellular raft of iron, and as soon as the ship is in position, the water which previously filled the cells of the raft is pumped out, gradually floating it, and lifting the vessel upon it out of the water. The railway cradle is placed on the pontoon before the ship is floated over it, in such a way that the pistons of the hydraulic rams can move between the timbers of the cradle, and as soon as the discharge of the pontoon begins to lift the ship from the water, the rams are set in operation and the pistons pressed against the hull, supporting it with a force

which can be very delicately regulated. When the pontoon has floated high enough to raise the cradle to the level of the railway, the shores are adjusted, and the valves of the rams opened, allowing the ship to settle into place on the cradle, which is then drawn upon the track. A similar device unloads the vessel at the other end of the line. The road is nearly straight, so that the cradle, four hundred feet long, can move almost without interruption from one end to the other; but five turn-outs are provided for, where, by means of floating turntables, the movement of the cradle and its load may be changed in direction, or the whole may be shifted to a side track, if desired, for inspection or repairs. It must be confessed that there is something attractive in the novelty and ingenuity of the whole plan, and there would be a considerable satisfaction in seeing it carried out, if not at Tehuantepec, perhaps at some other place.

M. PLANAT indulges, in the last number of *La Semaine des Constructeurs*, in some very interesting anticipations with regard to the future of aërial navigation, suggested, apparently, by a new experiment of Messrs. Renard and Krebs, who succeeded twice in one day in making a tour of thirty-five to forty-five minutes duration, returning in each case to the point from which they started. It is natural that this small but assured success should have called the attention of engineers and physicists again to the construction of balloons, and many suggestions have been made in regard to the best ways of building and sailing them, some of which will undoubtedly be tested before long. Reasoning from the examples of vessels to float upon the water, which gain in swiftness and in facility of handling with increase of size, the most obvious way of improving balloon navigation would seem to be by making the balloons larger, giving them at once greater steadiness and power, and enabling them to carry a heavier load of machinery to operate them. Nothing but metal would be suitable for balloons of great size, but with sheet copper, riveted like a steam-boiler, an envelope could be made, which would, within comparatively moderate dimensions, weigh only one-third as much, with its gaseous contents, as the air which it displaced. A copper balloon would be strong enough to admit of forcing through the air with all the speed which the machinery it could carry would be capable of imparting to it, and the next step to practical sailing through the air would be the invention of a motor lighter than anything yet known. Although Messrs. Renard and Krebs are believed to have employed in their balloon either a secondary electric battery, or a voltaic battery of great power, which is probably the best apparatus at present available for the purpose, few persons can think long over the problems of aërial navigation without arriving at the conclusion that the balloon motor of the future is likely to be a gas-engine of some sort. As hydrogen burns, or rather explodes, with its greatest force when mixed with eight times its weight of air, a balloon-engine, employing hydrogen, either compressed or not, as fuel, would draw eight-ninths of its fuel from the air around it; or, to put it in a different way, a hydrogen-engine using the gas simply as a fuel would, under such circumstances, do exactly as much work as a coal-burning motor consuming six times as great a weight of combustible matter.

WITH a balloon of the dimensions which engineers now contemplate, the fuel necessary for driving it through a journey of moderate length could be taken from the gas which held the whole suspended in the air without serious harm, especially if the balloon were charged to a pressure a little above that of the atmosphere, so that the consumption of the gas in the motor would not, by reducing the tension too much, expose the copper envelope to danger of collapsing; and M. Planat believes that this plan is likely to be tried. As to the advantages to be obtained by using the gas explosively, instead of as mere fuel, little is yet known, but if, as seems probable, investigation will teach us how to use more effectively the energy developed by explosions, it may be possible, as he suggests, to use a variety of substances in that way, in case hydrogen from the balloon should not prove serviceable. Again, as M. Planat says, the apparatus of cylinders, pistons and cranks by which power is converted into motion in terrestrial locomotives seems heavy and clumsy in a balloon, and he calls attention to the way in which the expansion of burning gases is used to urge forward rockets as a possible indication of a method in which the explosion of charges of hydrogen may be made to push a balloon through the air, without the intervention of any heavy machinery whatever. There is material enough in these suggestions for many new, and perhaps successful experiments; and so much interest is felt in the subject at present that we shall hardly have to wait long before some of them are tried.

A NEW kind of elevated railway is described in *Le Génie Civil*, as the invention of M. Angely, a French engineer; the principal point of novelty about it being that the cars are hung below the track, and have, according to the illustration published with the account, much the air of trains of caterpillars crawling along the underside of a twig. Like the Meigs railroad, about which so much discussion took place a year or two ago, the track consists of a single rail, but the suspension of the cars beneath the rail makes it possible to carry two rails, constituting a double track, from a single row of posts; the rails being hung from the ends of a short T, or double bracket, securely fixed to the posts by means of collars in the middle, through which the posts pass, rising some distance above, in order to give points of attachment for rods or cables, which sustain the rails at short intervals. In some respects this plan offers the best and cheapest solution of the elevated-railway problem yet devised. The posts are intended to be about forty feet high, and of plate iron, fixed in the ground by bolting to a mass of concrete. Spaced one hundred feet apart, they would occupy a comparatively trifling space in the roadway, and could be made perfectly capable of sustaining the double track, partly by means of the cross-pieces, strongly made of plate and angle iron, and partly by the braces from the top, which would not only be economical, but might serve to stay the cross-pieces, so as to prevent them and the posts from oscillation under the unequal movement of the trains. The track, according to the plan, is composed of a long lattice-girder, but with supports every twenty-five feet, as shown, a special rolled beam might perhaps be advantageously substituted for this, and the only thing then needed to complete the double line would be the horizontal wind-bracing between the tracks. Compared with the system in use in New York, where a double track requires at least two rows of posts, besides four continuous lattice girders, and a forest of ties and braces, the Angely scheme seems to promise considerable advantages, and although we should say that for nervous ladies a trip in one of his cars would be only second in point of discomfort to a voyage in a balloon there are no prejudices which habit will not overcome.

THE most efficient machine for killing our fellow-men yet invented appears to be the Maxim machine-gun, a utensil which any person can carry without difficulty into battle, and, having levelled it at his enemies and supplied it with a quantity of ammunition, he need do nothing more than turn a crank once, and retire to a place of safety. The gun then begins shooting by itself, and continues to fire bullets at any rate desired, from two a minute to six hundred, until its cartridge-belt, which contains three hundred and thirty-three charges, is exhausted. The advantages, to a warlike person, of being able to kill three hundred and thirty-three persons at a single effort, without exposing his own valuable person to injury, are so obvious that there is likely to be an extensive demand for the new instrument among Christian nations, and no one should fail to acquaint himself with the principles on which it acts. Every one knows something of the machine-guns hitherto used, the Gatling gun, with its six barrels tied together by bands, and the crank at its rear, being perhaps the most familiar, but all those hitherto used differ from the Maxim gun inemploying a continued force from the outside, generally applied to a crank or lever, to fire the charges, while the Maxim weapon loads and fires itself, after the first shot has been discharged, by utilizing the recoil of each discharge to effect the necessary movements; an ingenious system of springs and levers, operated by the barrel, which slides back about half an inch at each explosion, extracting and throwing away the shell of the cartridge just used, putting another in its place, pushing the barrel forward again, cocking the hammer and pulling the trigger, and repeating the whole series of movements as the barrel slides back again by the recoil of the new discharge. With all its ingenuity and apparent complication the new gun seems from the tests to be substantial enough for active service, and it is much to be hoped that the occasions for employing it will be rendered rarer by the very fact that its efficiency will make it dreaded.

OLD COLONIAL vs. OLD ENGLISH HOUSES.

THE almost universal use of wood in the construction of country houses owned by wealthy citizens is often a matter of surprise to foreigners visiting America. The early colonists, being comparatively poor, naturally availed themselves of this material, which was at hand in abundance. Why the well-to-do American of to-day should continue to build his country house of wood is perhaps explicable on the grounds that custom, rather than rational consideration, has guided him in his choice. Many writers and architects have found so much to admire in old colonial buildings that in recent years we have had a following more or less of the old work. Without denying the many points of excellence in this work, it would seem that fashion and the love of the picturesque have given the chief stimulus in this direction. We can admire, on the exterior, the almost microscopic fineness of delicate members on cornice and balustrade, and the pleasing effect of white and yellow paint, but at the same time it must occur to every thinking observer that much applied moulding and mitreing in wood is constructively objectionable. Sooner or later, depending on the care of the owner and his liberality in the use of paint, those mitre joints must open. The whole construction is at fault where any permanency is desired.

The early colonial builders knew something about Classic architecture, but their own ideas were very limited, and they seldom rose much above the imitation of stone-work in wood.

From an æsthetic standpoint, the regularly recurring horizontal lines of clapboarding have a hard, monotonous, inartistic effect, which is rendered still worse at the angles of the building by the straight, severe edges of the corner-boards. Contrasted with the less regular lines of masonry, the effect is poor. Architects have felt this; hence the more frequent use, lately, of shingles for covering large wall-surfaces.

If wood is still to be the main material used in country dwellings, some improvement should surely be sought, by using in conjunction with it a material less inflammable and more enduring. To cover the roof with tiles or slates, and the wall-surfaces with cement instead of clapboards or shingles would be a step in the right direction. We find numerous examples of this construction in the domestic architecture of England in the sixteenth and seventeenth centuries. As an illustration, we reproduce some sketches [see Illustrations] of houses in an old Suffolk village, Lavenham, which was one of the places visited this year by the London Architectural Association. Containing, in addition to its quaint old houses, a fine church, it is well worthy of a visit. Some sketches of wood-work from the interior of this church will be given in a future number.

The house in the sketch marked "*a*" was built about the year 1650, and it is in a habitable state and good condition now. The wood-work is of oak, and the roof is covered with tiles, originally red, now a dark brown. The surface of the walls is plastered, and the ornamental scroll-work was no doubt worked on the wall while the material was in a soft state, in the same way as the fine plaster-work on ceilings of this period was executed.

The villagers of Lavenham, with an appreciative eye for the effect of color, tinted the exterior plaster-work. Some houses were yellow, of a creamy color, others of red of various shades, from terra-cotta to "crushed strawberry;" others again were pure white. The street views "*b*" and "*c*," one of which, "*b*," is reproduced from a water-color sketch by a member of the Scottish Water-Color Society, will give an idea of the picturesque grouping and sky-line. From almost any point of view the pleasing variety of color — rich umber of the oak and the dark red of the tiles — makes a fascinating subject for the water-color painter. The wall-surface of house "*a*" was colored a light red; the repeated coats of color-wash and the action of the weather had softened the arrises of the ornament, and the effect of this work in low relief was very fine.

In "*d*" and "*e*" an indication is given of the ornament on the wood-work. For the most part it was cut out of the solid, dentils of various forms, ribbon-patterns, incised work and carving in low relief were favorite modes of enrichment. If we consider the right treatment of wood-work for exteriors, all the ornament needed can be had by moulding or cutting out *below* the surface of the timbers instead of building out and tacking on pieces, as the old colonists did. Still further, if carving is required, the best effects will be obtained by cutting with incised lines, with little or no modelling of surfaces. This enriches without losing the value of the constructional forms whether in a corbel or a gable rafter.

The capabilities of cement and its treatment are inexhaustible. First, there is the plain surface and different ways of finishing it in texture and color. There are simple, cheap and effective ways of treating the wall-surfaces. The age and good condition of these old houses is a practical test of the material. It may, however, be urged by some that although such plastered surfaces may stand in England, they will not stand the test of the climate in this country. Nothing could be more trying than the moist atmosphere, the searching, heavy rains and the variable weather in England during the winter months. As plastered surfaces have not been used externally in this country except on a small scale, the practicability of such work has yet to be tested.

Appended is the opinion of a gentleman who has had a very extended experience in the use of cement, both in England and America.

R. BROWN, JR.

THE subject in the foregoing article is one on which a great deal could be written, and I should be glad if the little I can say on the subject would be the means of removing a wide-spread, but ungrounded prejudice, that appears to possess the minds of the majority of architects in this country against the use of lime and cement for outside finishing.

When we take into consideration the great variety of effects, both in color and form, that can be introduced so readily and by such simple means, it appears strange that the subject should have so long remained dormant. Doubtless many of our rising architects would like to indulge their taste in this direction, but for the fact that they have no confidence in external plaster-work; they will argue that it will not stand the extreme changes of this climate. As a worker of lime and cement, who has had considerable experience in outside plaster-work, I must say that this assertion is simply ridiculous, when so many examples can be referred to, even on this continent, for I am told that in Canada, where the climate is even more severe than in the United States, there are many of the old houses with plastered exteriors now in good condition, that have stood the test for over a hundred years.

If we compare the climate of this country with that of England, I think it will be readily seen that the atmospheric conditions are more trying to outside plaster-work there than here. In England the atmosphere holds much moisture, which plaster will more or less absorb. Under such conditions it would certainly appear to be more susceptible of injury by frost. Very often, in the fall of the year, a rainy season sets in; everything is soaking wet for weeks, and then, suddenly, sharp frost will follow. This state of things certainly appears to me to be very much more trying to lime and cement work than the usually dry state of the atmosphere here; but we do not find that this work is affected, and numerous examples can be seen in England and Scotland which have stood the test for hundreds of years, and appear to-day as good as when the work was first done.

The methods adopted by our English ancestors in preparing the lime, especially for external use, were somewhat different from the present ways. Boiling the lime (unless it was for inside finish) was seldom adopted. In the spring of the year the lime was taken in large quantities fresh from the kilns, and as soon as possible sprinkled with water and allowed to slake to a powder; it was then passed through a sieve, usually a quarter-inch mesh. Next it was mixed with a little sand and made into a very stiff mortar, piled into one large heap and smoothed all over on the outside, to prevent, as much as possible, the moisture of the lime escaping. The lime thus prepared would probably not be used for at least six, or oftentimes twelve months afterwards, as it was not considered safe from blistering until kept for that time. When this lime was brought into use, it was mixed with as little water as possible, then a sufficient quantity of sand was added, and the whole rendered plastic by the use of beaters. It will be perceived that mortar so prepared would be very tough. When hair-mortar was required, cow-hair of the best kind only was used, and it was as a rule well beaten and thoroughly hooked into the lime, so that the hair was well separated, and not in lumps, as is often the case in these days.

There is another point that must not be lost sight of in the construction of those long-standing examples of half-timbered houses: this is, that the laths are usually made from selected English oak, as straight-grained as could be had, and split (the sappy parts being avoided) and nailed with wrought-iron clout nails.

Thus far I have endeavored to show the process of preparing the mortar in olden times. The mode of application was much the same, I have no doubt, as at the present time in all good work, by first putting on and pressing well between the laths, to insure a good key, a fair coat of well-haired mortar, the surface of which should be made rough by scratching. This coat should be thoroughly dry before the next coat of mortar is applied. The second coat should be from one-half to three-quarters of an inch in thickness, the surface of which could be worked into simple ornamental forms while in a plastic state, or the surface could be finished in "slap-dash," which is simply mortar made very soft and thrown on to the surface of the plaster with a scoop. This is the commonest way of finishing outside plaster-work, and may be rendered very effective, particularly when color is used in the mortar. Another very pleasing way of finishing is

"rough-cast" or "pebble-dash," which is done by throwing small pebbles or shingle into the mortar while it is in a soft state.

Having thus far endeavored to show the practicability of outside plastering in this country, we must not forget in conclusion that we have the material: the limes of America are excellent, and we have the advantage of splendid natural hydraulic cements, which could be used with the lime and produce a mortar fully equal to any of the mortars used in former days.

ROBERT JACKSON.

THE "*CASTALIA*" HOSPITAL SHIP.

THE twin-ship "*Castalia*" was bought some little time ago by the managers of the Metropolitan Asylum Board of London to convert into an hospital for small-pox patients. The managers had the matter before them of making floating hospitals on pontoons, and this vessel, the "*Castalia*," suited their views very well; they entrusted the conversion of the vessel into a hospital to Mr. Adam Miller, of Riches Court, Lime Street, London.

It was decided to make five large wards of the old cabin arrangement, and to build five other wards on the top, and place them *en échelon* (Figs. 1 and 2), so as to have them at angles with the centre line of the ship; giving more air, better light, and also reducing the number of patients in each ward; in fact these upper wards are each a cottage-hospital of itself. The dimensions of the wards vary a little, but the height is 23 feet, that is to say, the walls are 13 feet and the roof 9 feet. The windows are made similar to those in the hospitals on land, and are 7 feet by 3 feet.

The inlet of air is by slides worked by a screw, so that the quantity of air admitted may be graduated to the amount required. The air is drawn out by Boyle's extracting ventilators; each ward has two of those large ventilators, and, in the event of calm, close, sultry weather, there is fitted to each ventilator an air-blast, sent up from a large Farmer blower of Schiele's make, fitted in the engine-room below. This blast of air is sent up the pipes of the ventilators and causes an upward current of air to take place in these pipes. In this way the wards are kept cool and the air changed so many times an hour in each ward.

Each of the isolating rooms, bath-rooms, and lavatories is fitted with Boyle's ventilators and air-inlets similar to the wards. The hospital throughout is heated by steam coils, fitted by Messrs. Ridsdale and Co., Minories, London, each coil having a separate inlet and outlet into silent blow-off pipes. The temperature in any compartment may be raised or lowered as required, or as the doctor decides.

The upper hospitals with the isolating wards (Figs. 1 and 2) contain a large cubical space. There are attached to these upper wards, at each end of the vessel, out-houses for the use of patients; these contain four bath-rooms, ten wash-basins, eight water-closets, four latrines or sinks, and two urinals. One hot-closet or hot carving-table (Fig. 4) is fitted up and heated by steam, in each of the end upper wards; this is to keep the food warm for the patients. A scullery is also fitted up in each of the end wards for washing up dishes after meals.

The upper hospital wards are built with coamings of plate-iron 15 inches by ½-inch, rivetted to an iron deck, which covers the lower hospital (Fig. 7). Frames of angle-iron are rivetted at regular intervals to this coaming; they stand up 13 feet. The roof principals spring from this height, and they are also made of angle-iron. The sides, ends, and roofs are planked with yellow deal horizontally. The sides and ends have also a cross-lining on the outside of American yellow pine, making the thickness 2¼ inches. The roofs are covered all with 6-pound lead, instead of cross-lined with yellow pine.

The lower wards of the hospital-ship are five in number (Fig. 3), and are arranged to make use of the iron bulkheads that are fixed across the two vessels, binding the hulls together. These divided the "*Castalia*" into first and second saloons, etc., for passengers. The sides and ends of the lower wards are made of iron plate; the upper deck which forms the roof is plated all over with iron plating and covered with 2½-inch pine deck-planks, caulked water-tight. The lower wards are thus really cased with iron. They are similarly supplied with lavatories, hot-closets, and sculleries, as the upper wards; two skylights are provided in each ward to assist in giving light from above. The windows are all made as large as possible; they are 3 feet 6 inches by 2 feet 6 inches, divided into three sashes, similar to the upper windows.

The means of ventilation are, of course, much greater in the lower wards than the upper ones; the lower wards being much larger and not so high in the roof, the height from deck to deck being 8 feet.

At both ends of the lower and upper wards large isolating wards are fitted up. These rooms are provided for the purpose of isolating patients who may have been sent under the mistake that they are suffering from small-pox, and who prove, when examined at the ship by the medical staff, to be affected with measles, fever, etc. Every care is taken that patients with other diseases than small-pox shall not come into contact with any small-pox patients.

The patients are brought to the hospital-ship by the ambulance-steamers and are taken first into the reception-room and are examined, and are then allotted to the wards by the resident doctor. The separation of the sexes is rigidly enforced. The "*Atlas*" is now kept as a female hospital and the "*Castalia*" has been made a male hospital. The whole of the "*Castalia*" has been painted with Griffith's white paint and the Sanitary Company's enamel paint; every precaution has been taken, by painting, to prevent the germs of this disease from getting into the wood-work. Mr. Wythe, of Dalston, executed the paint-work. Messrs. R. and H. Green were the contractors to convert the "*Castalia*" into a hospital-ship. Messrs. Jas. Patterson & Co., of Ratcliff Engine Works, Stepney, supplied and fitted up all the machinery and pipes for the air-blast and the pumps for throwing water, for the water-closets, washing decks, fire-hose, etc. The engines are of the compound type, with cylinders 10 inches and 20 inches respectively, with a stroke of 2 feet. They are constructed to drive the Schiele's fan, and also a dynamo-machine for the electric lighting if required.

Very great attention and care was given to the ventilation of the hospitals. Professor F. de Chaumont, Dr. Bridges, Surgeon-General Bostock, and Mr. Barrington-Kenneth discussed the matter fully and arranged that Boyle's air-pump ventilators should be adopted. They also fixed the dimensions of these ventilators for the several wards according to the space to be relieved. The ventilators were tested one day during a smart breeze, and the speed, registered according to three anemometers placed in the ventilators, was at the rate of five hundred feet per minute, giving 50 per cent of the speed of the wind blowing outside, so that the atmosphere in the hospitals may be changed many times in an hour. Dr. Birdwood has since found that he can raise or lower the temperature in a few minutes, and he has caused the wards (when empty) to be filled with smoke by burning greasy waste, brown paper, cayenne pepper, etc. The fan blowers were put on, and in from three to four minutes all the smoke was cleared off.

The ventilators were made each with heads 6 feet in diameter, and were fitted with pipes varying from 3 feet 9 inches to 2 feet 6 inches in diameter. The lower wards have two ventilators of 3 feet 9 inches and eight of 3 feet 3 inches. The upper wards have four ventilators of 3 feet and six of 2 feet 6 inches. The lavatories and isolating-rooms have sixteen ventilators of 16 inches diameter. The cubical contents of the lower hospital are 73,465 feet; the superficial area, 9,308 feet; the window opening, 984.44 square feet. The cubical contents of the upper hospital are 84,607 feet; the superficial square area, 6,054 feet; the window opening, 1,792.52 square feet.

To provide for the satisfactory embarkation of passengers, piers are provided at various points by which they can be transferred from the ambulance to the steamer free from contact with the public. The first of these is the Longreach pier, which is erected close to the hospital-ships lying off Purfleet at Longreach. The patients embark and disembark to and from the ambulance-steamers, and to the hospital-ships, as may be arranged. The pier also accommodates the laundry staff in going and returning to their work from the staff-ship "*Endymion*." It is 193 feet in length over all; the moving portion is 125 feet long, the fixed part is 68 feet in length. The pier is lined throughout with yellow pine, and roofed over with glass, so as to keep the patients and others from getting wet. The moving portion of the pier rests at one end on a pontoon, which rises and falls with the tide; the other end is fixed to a stack of piles by a joint bolted to each of the girders, and also securely bolted on the piles. The fixed portion of the pier is also bolted to the same joint, thus making the connection of the moving and fixed parts. The pier is made so that ambulances may be taken down or up, with or without the horses. A porch has been built upon the pontoon; it is fitted with a waiting-room, stove, water-closet, urinal, etc.

A similar porch with conveniences is erected at the land end of the pier. The ambulances drive into this porch to take in or discharge patients under cover. The Rotherhithe Pier at Acorn Wharf is of similar design and accommodation, but is not roofed in. The length of Acorn Pier is two fixed spans each of 84 feet, and one moving span of 125 feet, in all 293 feet. The contractor for both piers is Mr. S. Chafen, Albion Street, Rotherhithe This pier at Acorn Wharf is for the accommodation of patients living in the southeastern districts.

There is a pier building for Blackwall at Brown's wharf for the accommodation of patients living at the east end of London. This pier will only consist of a moving part of 125 feet in length, resting on a pontoon similar to the other in accommodations, etc. The wharf at which this pier is to be attached will be roofed in so that all the ambulances may be accommodated on the wharf, and shut in from the street, and that the public may be kept clear.

The fourth pier is to be erected close to Wandsworth Bridge; it is to be for the accommodation of patients in that district. This pier will be similar to Blackwall Pier. These piers have been designed by Mr. Adam Miller, and are being erected under his superintendence. The "*Endymion*" and the "*Castalia*" are connected by a covered gallery which will allow a certain relative motion of the two vessels.

There are, in connection with the "*Castalia*," three steamers for the ambulance service, viz., "*Red Cross*," "*Albert Victor*," and "*Maltese Cross*." The latest, the "*Maltese Cross*," built by Messrs. Edwards & Symes, Cubitt Town, E., is designed with two hospitals, viz., one aft and one forward, and is made to carry twice as many patients as the first steamer, "*Red Cross*," constructed by the same builders. The dimensions of this steamer are as follows: Length, 132 feet; breadth, 16 feet 6 inches; depth, 7 feet 6 inches. The engines are of the oscillating type, with cylinders of 23 inches diameter, with 30-inch stroke, steam pressure of 40 pounds.

The hospital arrangements for the patients in the matter of beds and conveniences, ventilation, etc., have been carried out to the instructions of Surgeon-General Bostock, who has taken a great interest in all the ambulance arrangements. The accommodation for the crew is put forward. The captain and medical officer are placed on deck abaft the boiler casing. The nurses have a berth in each hospital; a store-room is made under deck, right aft the transom, for medical comfort. Filtered-water cisterns are placed on deck at each entrance to the hospitals; a galley, with a cooking range, is fitted at one of the wings of the paddle-boxes, so that in the event of the ambulance-steamer being delayed by fog in the river the patients would have the same comfort as in the hospital proper.

The ambulance-steamers have also been designed by Mr. Adam Miller, and the "*Albert Victor*" has also been converted by him into an ambulance-steamer. — *Engineering.*

ROOFING-TILES.

COMPETITION FOR EQUESTRIAN STATUES FOR BLACKFRIARS BRIDGE. LONDON. DESIGN BY R. BELT. SCULPTOR.

WHERE is no way to tell exactly at what time the art of making roofing-tiles was revived in England. But as the buildings of the Anglo-Saxons were usually of wood, rarely of stone until the eleventh century, and as the first instance of a modern or Flemish brick building in England does not occur until after the first half of the thirteenth century, it is not probable that roofing-tiles were made prior to building bricks.

We have been making building bricks extensively in the United States for more than three-quarters of a century; but it is only within the past few years that we have accomplished anything in the line of manufacturing roofing-tiles. The following statement in this connection is, of course, purely hypothetical; but we probably state the truth when we say that England has probably never discounted us, and made roofing-tiles before she made building bricks.

In 1784, tiles as well as bricks were subjected to taxation by George III, which burden lasted for two-thirds of a century, not being repealed until 1850.

The plain tiles now in general use in England weigh from two to two-and-one-half pounds each, and expose about one-half their surface to the weather, four hundred of them covering "a square," or one hundred superficial feet of roof-surface; they are sometimes hung upon the sheathing-board by two oak pins inserted through holes left by the moulder. Plain tiles are also now made with grooves and fillets on the edges, so that they can be laid without overlapping the usual distance, the grooves leading the water. This may answer for some cheap constructions where lightness is also a consideration; but the plan is a bad one, as they will be certain to leak in the driving rains and drifting snows, and they are also, if not very thoroughly burned, subject to injury by hard frosts.

Pantiles were first used in Flanders, the wavy surface lapping under and being overlapped by the adjacent tiles. The English pantiles weigh from five to five-and-one-quarter pounds, expose ten inches to the weather, and one hundred and seventy-five of them cover a square, or one hundred superficial feet of roof-surface. Modifications of the pantiles have been made in which the central portion is flat, and the edges turn up and down respectively.

In England a gutter-tile is sometimes used, and forms the lower course, overhanging the lower sheathing board or lath, and is nailed to it.

Sliding-tiles are used in this country and in Europe sometimes, as a substitute for weather-boarding; holes are made in the tiles during moulding, and they are secured by flat-headed nails to the lath. The exposed face of these tiles, called the gauge, is sometimes indented to represent courses of brick; fine lime mortar is introduced between them, when they rest one upon the other. Tiles of this character are sometimes called weather-tiles, and sometimes mathematical-tiles, the names being derived from their exposure or marking. They have a great variety of forms, having curved or crenated edges, and are also variously ornamented with raised or encaustic figures.

Roofing-tiles were probably used in Normandy before being employed in England, as the latter country always followed in the wake of its more energetic neighbors in all matters relating to architectural progress. All the rich Norman mouldings were copied by the English, and, as a great part of the knowledge of the art of manufacturing decorative tiles was derived from the Normans, it is not improbable that they are also indebted to them for a knowledge of the manufacture of roofing-tiles. The Normans were an active race, and delighted in building; to dwell in and constantly beautify their magnificent castles seems to have been the delight and greatest pleasure of their princes and nobles. But of course no credit is due to the Normans, for having originated the use of roofing-tiles, as they had been employed in the East, and the art of their manufacture was borrowed by the Crusaders. The highly ornamental buildings of Byzantium, Palestine, and Syria, were very attractive to the Crusaders, and as many of the early Norman roofing-tiles correspond with features of Byzantine architecture, the analogy is a corroboration of the statement previously made.

When roof-tiles are to be glazed, they are sometimes varnished after being burned; the glaze is then put on, and the tiles are placed in a potter's oven, and remain until the glaze commences to run. The glaze is usually made from what we call lead ashes, being lead melted, and stirred with a ladle till it is reduced to ashes or dross, which is then sifted and the refuse ground on a stone and resifted. This is mixed with pounded calcined flints. Manganese is sometimes employed to produce a glaze, which is usually of a smoke-brown color. Iron-filings are also used for producing a black color; for green, copper slag; and for blue, smalt is employed, the tile being first wetted, and the composition laid on from a sieve. Cheap salt glaze can also be applied to tiles in the same manner as for earthenware sewer-pipes.

Before proceeding to describe the method of manufacturing roofing-tiles we will first consider some of the advantages which accrue from their employment. Tiles when well made and thoroughly burned are indestructible, and are not affected by heat and cold. They will not crack and slide off the roof like slate, leaving the sheathing exposed, when subjected to sudden heat, as by the burning of an adjoining building. In addition to the fact that after doing service on one structure the tile can be taken off, and used on other buildings, there is the picturesque appearance which modern tile-covered roofs add to the architectural effect. Another great advantage for the tile-roof is that it is a non-conductor, and, therefore, cooler in the summer season than other roofs; the buff tile being lighter in color is preferable in the latter respect, as it does not absorb the rays of the sun. A final advantage which, although we mention it last, is of paramount importance where cisterns are employed, is that the rain-water collected from a tile-roof is much purer and more healthful than from any other kind of roof, as the tiles are very smooth, and no dust or soot settles upon them.

Objections to roofing-tiles in this country, have heretofore been made to the effect that the tile was heavy, made of coarse clay, poorly burned, and that it would absorb a great amount of moisture, so that freezing and thawing would cause it to crumble, and in appearance, it was anything but handsome. Whatever foundation these objections may have had in the first product of tiles, our manufacturers have now fully met and remedied these drawbacks to their use.

Tiles should not be put upon a roof that has less than one-quarter pitch (a slant of six inches to the foot), although we have seen some roofs of less pitch which have proved quite satisfactory. A roof to support tile should be somewhat stronger than for shingles. Rafters 2″ x 6″, spaced 18 inches apart and well stayed so that they cannot spread, form a good frame. The sheathing should be of white-pine, of even thickness, and close together. Generally, felt or tarred paper is placed under the tile, although it is not necessary to make the roof water-tight, but it impedes circulation and makes the roof warmer in winter, and adds but little to the cost.

When the process of manufacturing roofing-tiles is conducted by hand, the method is about the same in the United States as in England, and but few improvements have been made in this mode of production during the past century, but by the machine process we are enabled to manufacture very satisfactory roofing-tiles at but a small cost when compared with the hand method of moulding. The clay of which the tiles are made is dug and spread out in shallow beds to disintegrate during the winter season, the water contained in the clay expanding and breaking it in every direction. At one time very inferior roof-tiles were made in England, on account of the careless weathering or preparation of the clay employed; and in order to cure this, a statute of Edward IV required that all clay for tiles should be dug or cast up before the first of November, and not made into tiles before the March following. Sometimes when the clay has not been exposed to the frost it can be disintegrated by spreading it out in thin layers, and exposing it to a hot sun.

Iron rolls are often employed to disintegrate the clay, and crush or separate from it all stones and gravel. The clay must next be tempered, that is, reduced to a homogeneous and plastic mass. The usual form of pug-mill employed in England for tempering clay for roofing-tiles is generally six feet high, three feet in diameter at the larger or upper end, and two feet at the bottom. The clay is kneaded and thoroughly mixed by a revolving cast-iron spindle, which carries a series of flat steel arms, so arranged as to have by rotation a worm-like action upon the clay, which is pressed from the larger to the smaller diameter of the tub in which the clay is confined, and finally comes oozing out of an aperture at the bottom; in this manner of

tempering, great cohesive power is given to the clay. After it issues from the bottom of the pug-mill, the clay is usually ready to be moulded into roofing-tiles, the moulding is commonly conducted in a shed, and most of the manufacturers prefer to place their tiles in the open air, if the weather allows.

The moulding-table or bench upon which the tiles are shaped is supported on four legs, which are placed well under the bench, leaving the two ends of the top of the table to project liberally. The coal-dust box 14″ x 8″, is at the left hand of the moulder, resting on the corner of the table, and the moulding-board, 14″ x 10″, is usually placed slightly to the right of the coal-dust box. The mould employed is 12″ x 7¾″, and one-half inch thick, made of oak, and usually plated with iron. The moulder, when he wishes to form a tile, works a lump of clay with his hands into an oblong square, the mould is placed on the bench, and fine coal-dust sprinkled over it; the lump of clay is then taken up and dashed down into the mould with force, the surplus clay is cut off level with the top of the mould by a brass wire strained upon a wooden bow, and the tile in the mould is finished by adding a little clay to it, if necessary, and smoothing the exposed face with a wooden tool. The moulded tile is then placed upon a thin board, first sprinkled with very fine coal-dust, and so the process is repeated, the lump of clay being added to, every time six tiles are moulded.

The boy or off-bearer carries two tiles at a time, one on his head, and one on his hands to the floor, where they are allowed to remain for four hours out of doors in fair weather, and then collected and placed together, the nib end changed alternately, so as to hack them closely and squarely. The situation of this hacking should be dry, but not hot, and the tiles remain hacked for two days, so as to allow them to toughen.

The set or curve form is then given by placing six of the tiles at one time on the top of the horse, which is a three-legged stool, having the top about three-quarters of an inch longer than the tile, the top being a convex curve to a radius of about ten feet and three inches, and having a height of about two feet and seven inches from the level of the ground. In placing the tiles on top of the horse, the nib end is reversed each time, and as they lie closely together, three quick blows are given to the tiles with a block, which is concave, so as to correspond with the convexity of the horse. The tiles are then again hacked and dried, and next carried to the oven, twelve at a time, with the edges of the tiles resting against the breast of the carrier.

About nine thousand tiles are commonly burned at one time, when the old-fashioned Staffordshire oven is employed; but with larger kilns the quantity of course can be increased. The time required to burn the small ovens of tiles is usually about from thirty-six to forty hours.

The manufacture of plain roofing-tiles such as we have described, can be conducted with a small capital, the process and requirements not being intricate or expensive. But to conduct the manufacture of all the tiles required for roofing, and the numerous other articles generally made in large tileries requires a large capital, and a thorough knowledge of the business in all its details. To faithfully describe the manufacture of all the articles produced in extensive tileries would increase this paper to such an extent as to fill a large volume; the principle of procedure is the same in each case, but no two different articles are made or finished in a similar way, each requiring different tools and moulds.

In the London tileries, which are the largest in the world, there is paid particular attention to the proper preparation of the clay for the particular purpose for which it is to be used; there not being the same haste to get the clay into the kiln that is so often shown by some of the smaller manufacturers. The first step in preparing the clay in the London tileries is the weathering, which is accomplished by throwing the clay into pits covered with water, and leaving it to soften or ripen. The clay is then usually passed through the rollers, and the stones taken out before it is put into soak, which is a term also used for the mellowing process. The kilns used for burning the wares produced in these extensive London tileries are usually conical in shape for more than one-half the height, about forty feet wide at the base, and have a total height of about twenty-five feet from the bottom of the ash-pit to the top of the dome, which is slightly convex. These kilns are quite expensive to construct, eight thousand dollars being about a fair average cost, as fire-bricks of the best quality are largely employed in the interiors.

The manufacture of roofing-tiles is a comparative new industry in the United States; but it is one which is now rapidly growing in public favor. With us, the tiles are usually of three colors, red, buff, and black. The color of the red tile is produced by the employment of clay containing a large per centage of oxide of iron; this is sometimes present in the beds with fire-clays, which are the class usually employed for roofing-tiles; at other times, it is necessary to mix some foreign clay, containing a large percentage of oxide of iron with the material. The color is made deeper and more uniform by rubbing the tiles with finely-sifted red moulding-sand; this should be done while the tile is quite damp, so that the sand can be made to adhere to the tile. The buff-colored tile is made of nearly pure fire-clay, and is slightly lighter in weight than the red tile. The black-colored tile is produced by washing it over with manganese dissolved in water before the tile is placed in the kiln, and in the process of burning the manganese is converted into a perfectly durable coating of great hardness.

The small diamond tiles are 6″ x 10″, require 500 to cover a "square," and weigh 600 pounds. They are nailed to the sheathing with two five-penny galvanized nails, and are used more especially for towers, porches, dormer-windows, and in side panels for ornamental purposes.

Large diamond tiles are 14″ x 8½″, 250 cover a "square," and weigh 650 pounds. Two six-penny galvanized nails are used to secure it to the sheathing. This kind of tile is used more than the other forms for regular roofs, as it is lighter in weight, and less in cost.

The shingle tiles are the plain flat tiles, the manufacture of which we have described in this paper; after burning they are three-eighths of an inch thick, have two counter-sunk nail holes, and can be made of any required size not exceeding 6″ x 12″; they can be obtained from the manufacturers, who keep them in stock. Tiles have been largely employed in the Eastern States, and on some expensive buildings for roofing and side ornamentation, as at the State Capitol at Albany, N. Y., on which building they are secured with copper wire to iron ribs. Tiles of this kind are generally laid so as to expose about five inches to the weather, which require 480 to a "square," the weight being about 1100 pounds.

The pantiles measure twelve inches in length, by six-and-one-half inches in width at one end, and four-and-one-half inches at the other, and if they are lapped three-and-one-half inches on the roof, 350 will be required for a "square," which will weigh 850 pounds. This kind of tile makes a strong roof cover, and can be walked upon without danger of breaking, and it is especially suitable for workshops and factories; it is sometimes made with lugs to hang on to ribs, the use of nails being thereby avoided, which is desirable, as nails are liable to rust away where much bituminous coal is used. But the tiles are also made with nail holes to secure them to the sheathing-boards, as for private dwellings, etc.

The varieties of tiles which we have just described are made at Akron, O., in large quantities, and are shipped to all parts of the United States. In England and other portions of Europe roofing-tiles are mostly made by the hand method; but in our country they are almost entirely produced by machinery.

The crestings and finials used with tile require artistic treatment, and are generally made by manufacturers of terra-cotta.

Charles T. Davis.

THE ILLUSTRATIONS.

NEW BUILDING FOR THE INSANE, CONCORD, N. H. MESSRS. RAND & TAYLOR, ARCHITECTS, BOSTON, MASS.

THE trustees of the New Hampshire Asylum, having long felt the need of a building for a certain class of patients, in which their surroundings may be as much as possible like those in a quiet, well-ordered home, have been the first within our knowledge to carry their ideas into effect, in a building shown in the accompanying illustration. It is called the "Bancroft Building," in compliment to Dr. J. P. Bancroft, superintendent of the asylum for more than twenty-five years. In the planning of the building the idea has been to avoid all appearance of restraint, as well as everything to remind one of the ordinary hospital ward. There are fireplaces, open stairways and bay-windows, and a home-like, domestic look in all the arrangements. All rooms for patients face to the south, east or west, the north side being occupied by the stairways, storage-closets, etc. Each patient has a parlor with a bay-window, a bedroom, and a water-closet. The general sitting-room runs across the entire width of the building. It has a large octagonal end to the south, and two fireplaces. Every room is heated by indirect steam, and has two ventilating flues, the flues being built in the partition walls, which are all of brick. The outside walls are hollow, so that no wooden furrings or lath are required. Connection with the main building of the asylum is obtained by a corridor about one hundred and fifty feet long, on the east side of which it is planned to build the special dining-rooms, serving-rooms, etc., the food-supplies coming from the general kitchen. The exterior shows a granite underpinning and brick walls. Terra-cotta and moulded brick are used to some extent, the latter being made at the local yard which furnished the other bricks. The roofs are slated, and there are no gutters except on the porch roof. The cost of the building was $37,000. It has been built by the day, in the most thorough and careful manner; the sanitary appointments especially have been studied and executed with great care. The decorations and furnishings of the rooms have been done so as to enhance still further their home-like effect. The walls and ceilings are all harmoniously painted, each suite being different from the others.

A MONUMENT TO MUNICIPAL FOLLY: — A DRINKING-FOUNTAIN ON BOSTON COMMON.

Apropos of the drinking fountain which has been accepted by the Boston City Government, at the hands of a San Francisco cold-water enthusiast, and set up in a conspicuous position on the Tremont Street Mall, the Boston *Evening Record* offers the following fable: —

A Frog-Pond, rubbing its Eyes with Amazement, one morning saw an intrusive Drinking-Fountain near at hand. Accustomed only to the Best Society, the Frog-Pond cried out: "Who are you, and what are your intentions?" A Marble Smile played over the Fountain's Pacific Features as it replied: "I am engaged by the Year, as a Protest against

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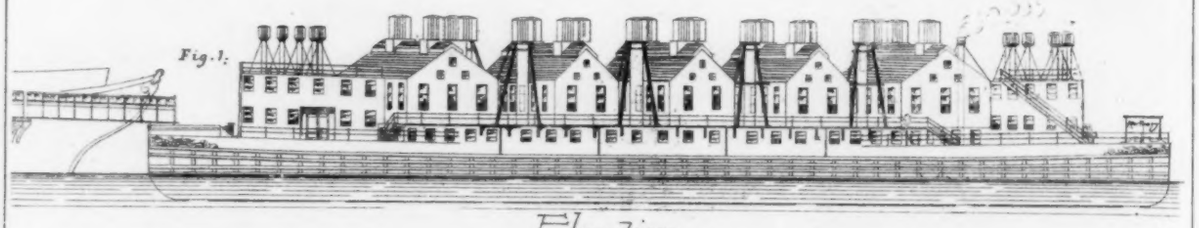
Fig. 1.

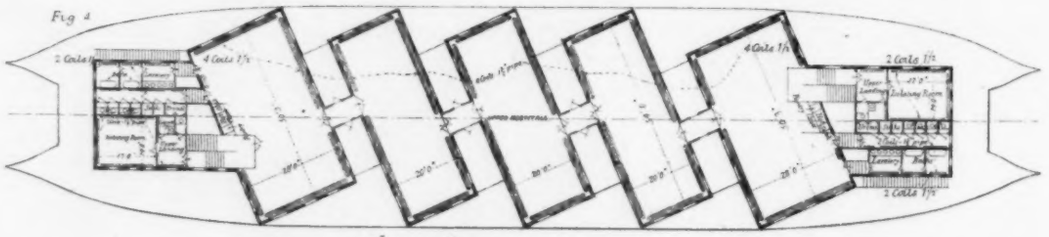


Elevation

Fig. 2.

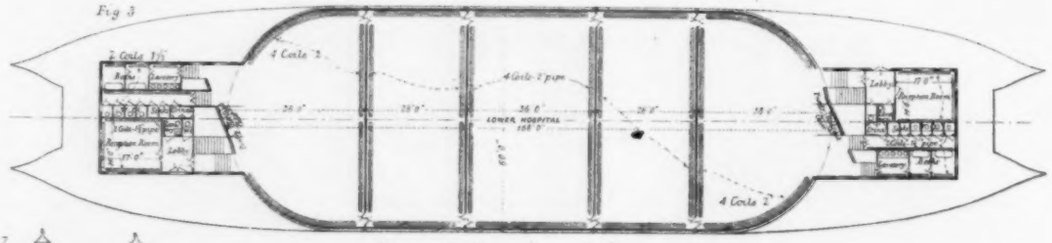
Roof Plan

Fig. 4



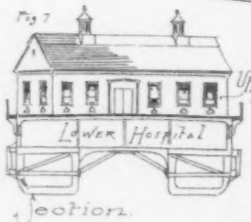
Plan of Upper Hospitals

Fig. 3

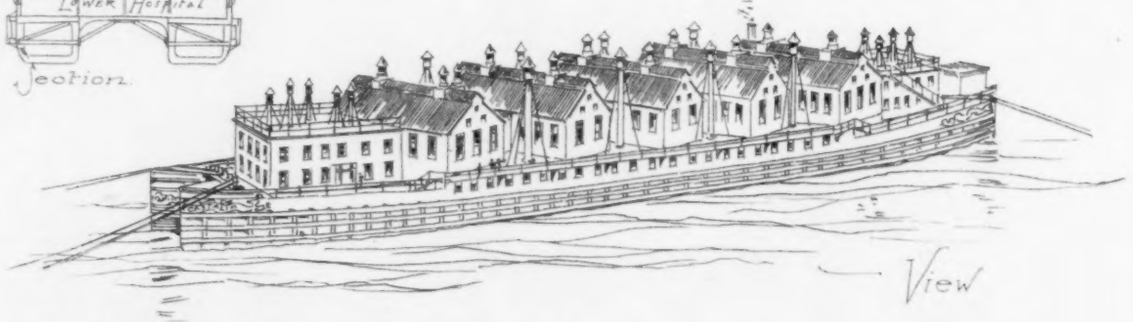


Plan of Lower Hospital

Fig. 7



Section.



View

The "Castalia" Hospital Ship, London, Eng.

MR. ADAM MILLER, ENGINEER.

HELIOTYPE PRINTING CO. BOSTON

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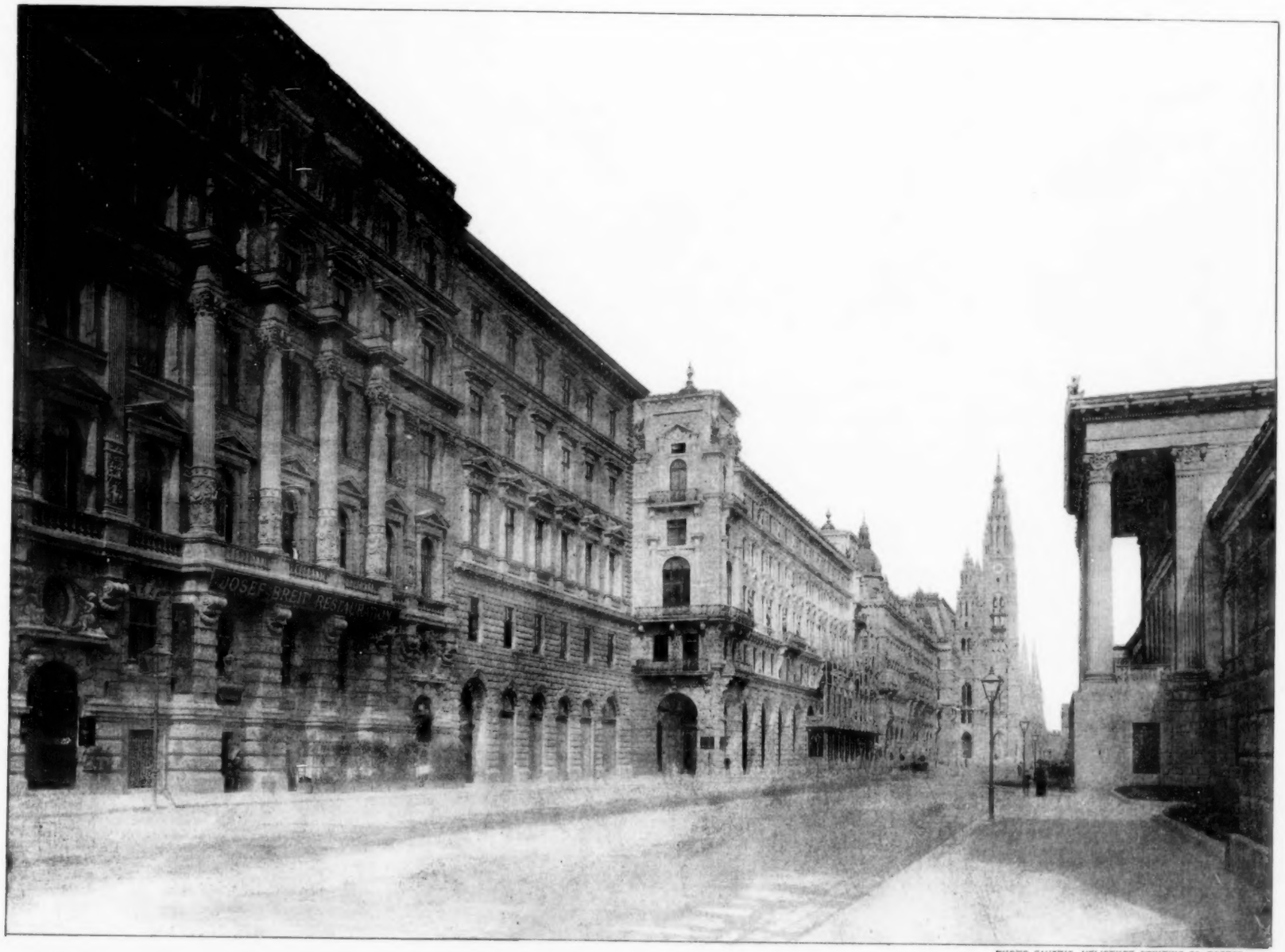
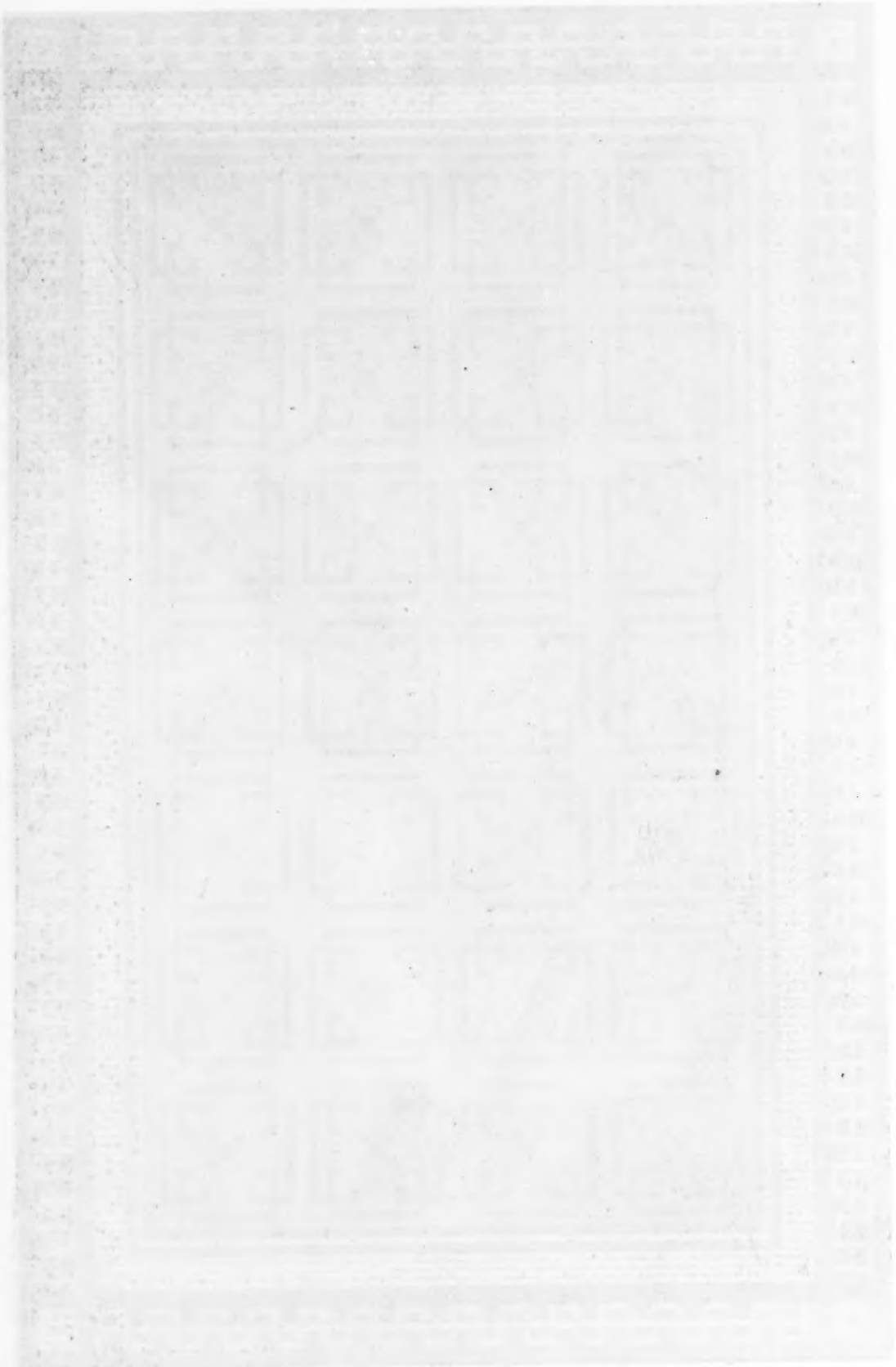


PHOTO CAUSTIC, HELIOTYPE PRINTING CO., BOSTON.

A STREET VIEW, VIENNA, AUSTRIA.



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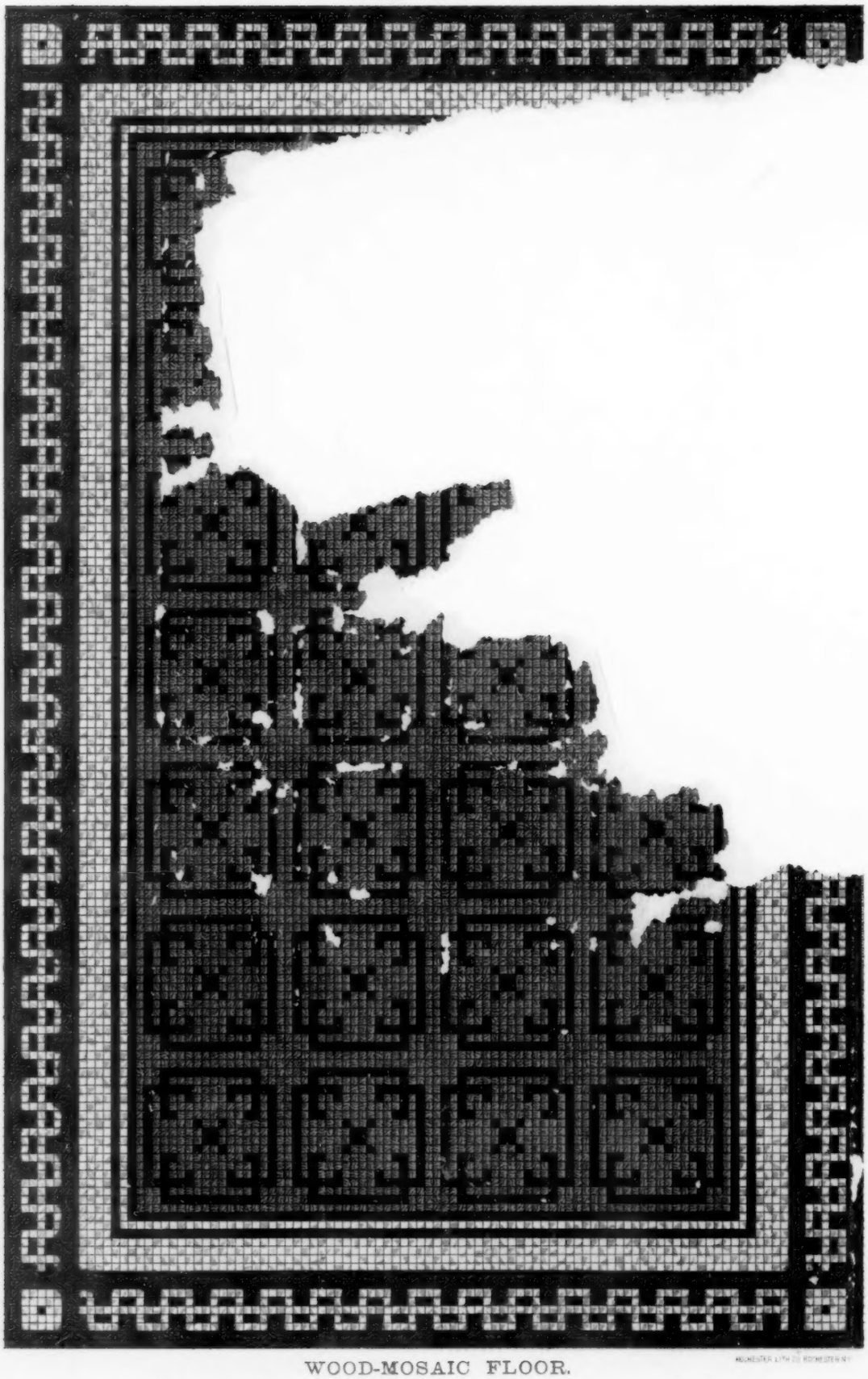
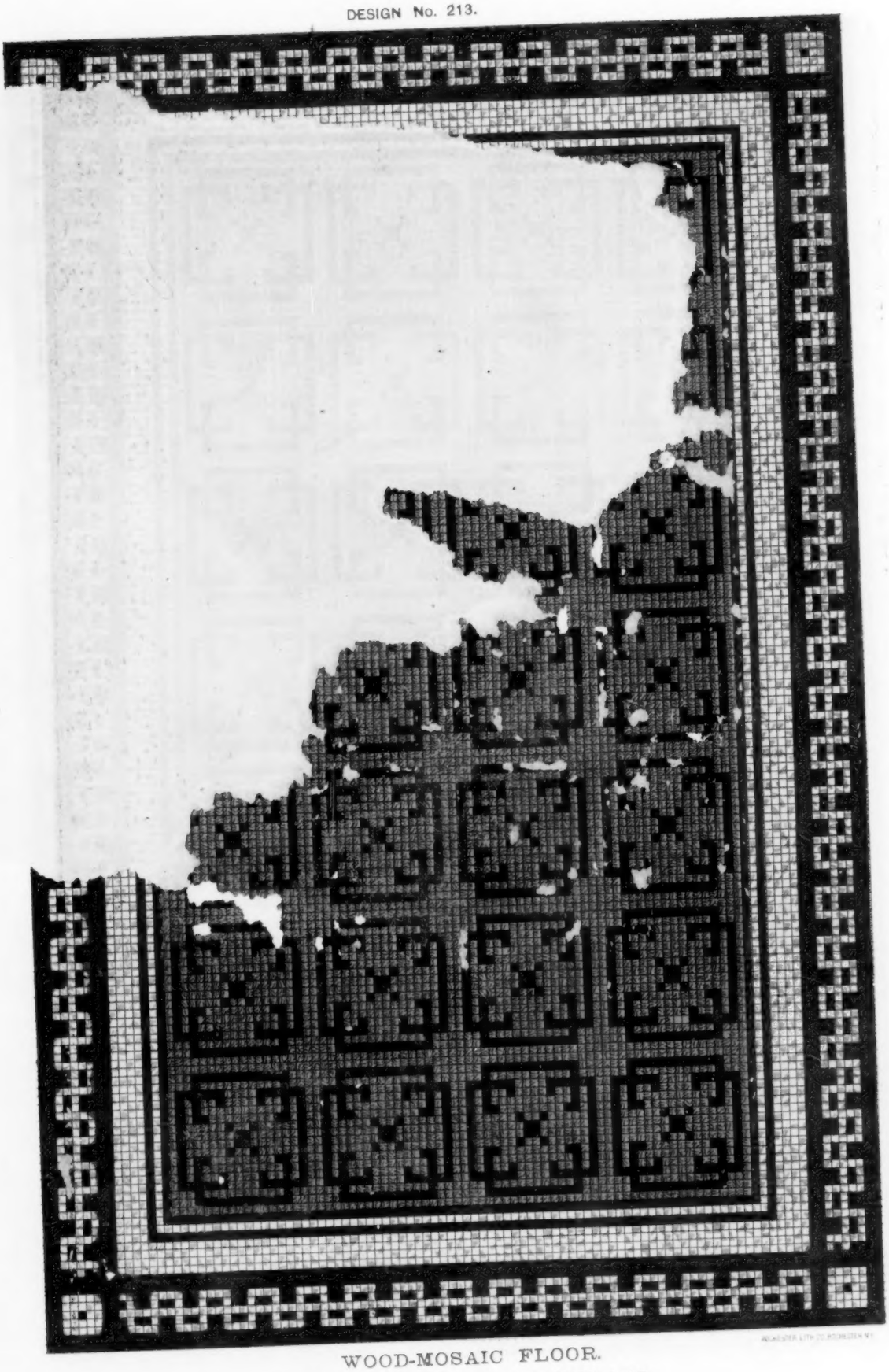


WOOD-MOSAIC FLOOR.

DESIGNED AND LAID BY W. C. RUNYON & CO.,
ROCHESTER, N. Y.

DESIGN No. 213.



WOOD-MOSAIC FLOOR.

DESIGNED AND LAID BY W. C. RUNYON & CO.,
ROCHESTER, N. Y.

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c.
A street in Lavenham

d.

1885 JAMES R. OSGOOD & CO

'b' The main street From a water color sketch by A.K.B

'e'

'a' Robert Swain Gr 188-

HELIOTYPE PRINTING CO. BOSTON

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A MONUMENT TO MUNICIPAL FOLLY.

THE NEW DRINKING FOUNTAIN ON BOSTON COMMON.

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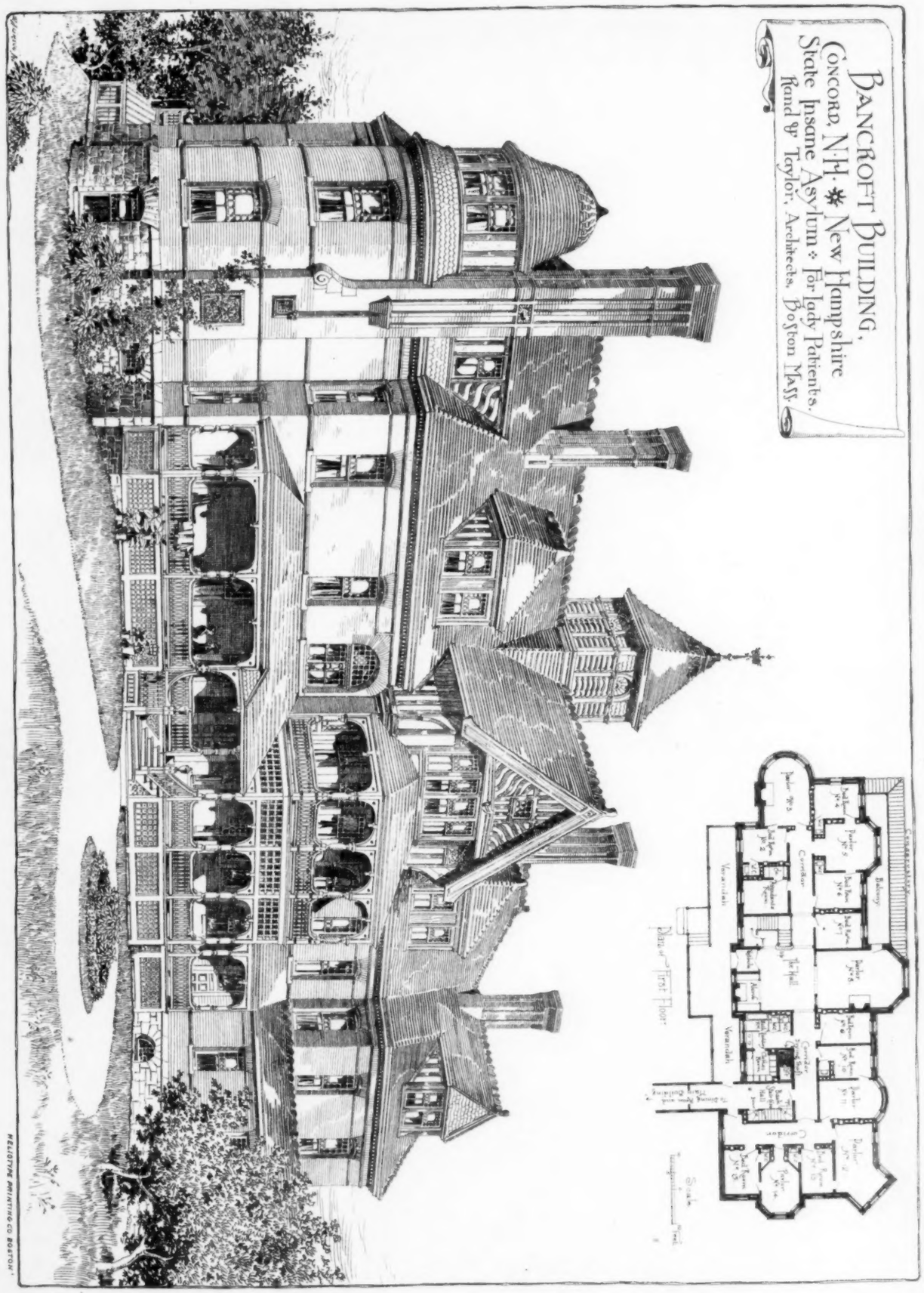

Pure Art." Whereupon the Pond remarked; "Seeing you are merely an Awful Example, perhaps you may Stay."

Moral: Repulsive-looking strangers should be treated with Courtesy, for their Ugliness may be useful in making your Comeliness more Obvious.

This fable and the illustration we publish mutually explain each other so effectually, that we trust that other City Governments to whom similar gifts are now being offered, will see the wisdom in declining them "with thanks."

THE "CASTALIA." HOSPITAL-SHIP ON THE THAMES, LONDON.

FOR description, see article elsewhere.

SKETCHES AT LAVENHAM, ENGLAND.

SEE article on "Old Colonial *vs.* Old English Houses."

A STREET VIEW IN VIENNA, AUSTRIA, IN 1884.

THE spire of the Votiv Kirche shows dimly in the distance, the spires in the middle distance belonging to the new City Hall. The rear of the Rathhaus shows in front on the right, and the buildings on the left are some of the apartment-houses for which Vienna is celebrated.

THE ELECTRICAL EXHIBITION AT BOSTON.

THE American Electrical Exhibition now open in the building of the Massachusetts Charitable Mechanic Association, though perhaps not as complete in all its details as one could wish, is well worth a short visit by any one who is interested to note the progress which electrical science has made in the last few years. The electric-light systems shown there are thoroughly representative of the advancement which this branch of the science has made in the last few years. The writer remembers, at an exhibition of the Massachusetts Charitable Mechanic Association, held, unless he mistakes, six years ago, the Wallace-Farmer arc lamp, which was then held to be one of the best arc lamps made, and the contrast between the jumping, changing, and altogether erratic light from them and the steady, clear, colorless light from the carbon pencils of the improved arc lamps in the exhibition to-day, is but a feeble indication of the improvements made in electric lighting in various directions.

Among the various ingenious pieces of mechanism shown at this exhibition, perhaps the one which attracts the most attention is the electric railway system which has its track extending around the gallery. It embraces more than is apparent at a first glance, for the pair of conductors which extends around the gallery, inside the rails on which the cars run, carries electricity not merely for turning the motor by which the cars are driven, but also to furnish light for the cars, heat for them, if it is desired, and light for various points along and around the route. The way in which the conductors are run separate from the rail and thoroughly insulated on their supports allows the use of a current of electricity of rather high pressure, or tension, as it is usually termed, and by this means the use of the current for various forms of work is possible even at a considerable distance from the point at which the dynamo-generators and engines are situated: in this particular instance they are about half a mile from the exhibition-building, and would undoubtedly work equally well were they placed at twice or even four times the distance. As the use of electric motors for propelling cars, both on surface and elevated roads, is attracting much attention, it is interesting to observe how easily the current acting on the motor, which is capable of drawing forty-five persons round a curve of only twenty-five feet radius, is controlled by the attendant in charge, and how readily the current can be made to act as a powerful brake on the cars, by a movement of a small switch, very different from the massive lever and connections used to reverse the direction of a locomotive steam-engine. The absence of dirt, noise, smoke and escaping steam is very attractive when one thinks of the progress of a train on the elevated roads in New York, and one rejoices to think that there is even a possibility of a change to such a motor as is here shown.

The electric lights are the most noticeable parts of the exhibits on the floor of the building, and the possibilities of ornamental work in this direction are well suggested by the combinations of lamps and globes of various sizes, shapes and colors, in chandeliers, large and small, and single fixtures in all sorts of places and positions. The Edison Company has a very complete display of the fittings used by them in their work, both in buildings and for carrying their wires through the streets, and the ingenuity displayed in overcoming the various obstacles which have presented themselves is worthy of great commendation. Besides these, they have a large number of incandescent lamps, lighted every evening from the 250-light dynamo situated in the basement and driven by one of the small, high-speed steam-engines which have been found most satisfactory for this class of work.

The N. E. Weston Electric-Light Company also has a large number of lights throughout the building, part of which are supplied by dynamos situated in the basement of the building, and part from dynamos in the factory on Stanhope Street. From this factory also comes the current for the railway around the gallery. This Company has three kinds of lamps on exhibition: their arc lamps, which are too well known to need description; their small incandescent lamps, giving a light equivalent to sixteen standard candles each; and their large incandescent lamps, giving a light equivalent to one hundred and twenty-five standard candles each. These last have but recently been introduced, and seem likely to be of use in lighting large spaces when a steadier light is needed than is given by any of the arc lights now in use. The Weston Company has also several motors in different parts of the building, varying in capacity from one to five horse-power, and used for running a printing-press and other machinery of different kinds, some requiring considerable power, and others very little, thus showing the applicability of electric motors to almost any work not requiring over ten-horse power. There are also in the exhibition several smaller motors, of proper size for running a sewing-machine or jeweller's lathe, for which current is supplied by the Weston dynamos, and the application of one of these to running a model of a passenger-elevator suggests the possibility of applying the larger sizes to running elevators for actual work in buildings near the wires conducting the electric-lighting currents in our cities.

Opposite the exhibit of materials of the Edison Company are some of the first fire-alarm instruments used in the city of Boston, there being both the boxes for sending the signal to the headquarters of the department, from the vicinity of the fire, and the apparatus for striking the number of this box on the bells through the city. As we compare the magneto generator used for this purpose in those times with the perfected apparatus now in use in the tower of City-Hall, we wonder that a successful system was ever developed from such beginnings, and admire the persistence of Messrs. Channing and Farmer, who developed the system to something like its present perfection. In the gallery we find two systems of fire-alarm in which the heat of the fire itself gives notice of its existence, and, by ingenious devices, gives further notice at any desired point of the location of the flames. These systems are both the result of close study of the needs in this direction, and seem likely, if at all generally used, to lessen the enormous fire-loss. One of these systems is combined with a watchman's-clock: the same wires are used for the registering apparatus for the watchman and the little "thermostats" which close the circuit and give the alarm in case of fire, thus making double use of them, and securing nightly testing of the completeness of the circuit and battery. There are also two other watchman's-clocks exhibited in different parts of the building, one of which is so arranged that if the watchman fails to do his duty by going to each of the prescribed stations in the building within a given time, an alarm is given at any point desired within a mile or two of the building, thus giving additional assurance of the safety of the premises.

In another part of the gallery is an ingenious system of railroad signals, in which notice of any occurrence likely to cause an accident is given not only by colored signals or lights near the track, but also by ringing a bell in the cab of the locomotive approaching the place. The arrangement of circuits, bells, and batteries in these devices is very ingenious, and worth some study on the part of any one interested in such matters.

The display of the Bell Telephone Company is interesting chiefly from an historical point as their collection of the different kinds of telephone transmitters and receivers, and the different forms of calls used up to the present time in their many "central offices," is very complete. There is also on exhibition, in working order, one of Mr. Edison's chalk-cylinder receivers, commonly known as the "motophone" or "motograph," an instrument which actually reproduces the vibration caused by the voice louder than they were spoken into the transmitter at the other end of the line. The difficulty about the use of this instrument is the necessity of frequently moistening the cylinder with dilute sulphuric acid, and of frequently adjusting the point which rests on the cylinder and transmits the vibrations to the diaphragm of the instrument. They have also a set of telephone instruments, which can be attached either to the transmitter, which they have placed in the Bijou Theatre, or to the metallic circuit line which they have built to New York, and over which conversation is readily carried on many times a day; the instruments in New York are in Mr. Edison's laboratory on Fifth Avenue, and any one who desires may have the opportunity of talking without difficulty with a person two hundred and fifty miles away. Mr. Edison has on exhibition a large number of his inventions in telegraphic work, among which are his last "quadruplex" instruments, which are now the standard instruments used by the Western Union Telegraph Company, and his instrument for automatically reproducing a drawing or writing made by a specially-arranged pen, at the other end of a telegraph line. This instrument proved too delicate for ordinary commercial work, but with careful adjustment can be made to reproduce the movement of the pen with great fidelity.

Two systems of conduits for electric wires are shown, both of which are intended to be placed along the curb of the roadway, and to form part of it, and are largely constructed of iron. One of them at least seems as if it might prove to be a practical system, and may be of

assistance in ridding our roofs and streets of the poles and wires which at present so disfigure them. There are also a large number of the various electrical devices used so largely in houses, hotels, and other buildings, such as call-bells, with the knobs for ringing them, electric gas-lighters, and burglar-alarms. Among these may be mentioned the electric gong and apparatus for striking it, used by several of our railroads for giving the signal for starting trains; this can be made to strike the gong automatically at the proper minutes during a whole day, being controlled by a drum set with pins, which is driven by impulses from the clock at the Observatory in Cambridge.

There is also a set of telephone instruments to which is attached a device for automatically showing whether the line on which the in struments are placed, is in use or not. There is also a set of the instruments used by the Oram Time-Repeater Company, for indicating in the telephones of any central office the beginning of each minute throughout the day.

The miniature theatre, lighted by incandescent lights, and around which are telephone receivers attached to the transmitter at the Bijou Theatre, attracts a great deal of attention during the hours when the play is going on at that theatre, and is really a very pretty and attractive sight during the evening.

The exhibition of the working of an ocean cable is shown very completely in the little tent arranged by the cable company. They use both the flash of light by which all messages were sent until recently, and Sir William Thomson's "siphon recorder," which is a very fine glass tube, drawn to a point and filled with ink. A roll of paper is drawn under it, and the right and left movement of the point produces a wavy line in which the height of the undulations determine the nature of the signal sent.

There are also on the lower floor, two incubators or hatching machines, in which electric devices are used to control the heat supply, used to hatch the eggs; and with one of them there is also a similar arrangement for opening and closing the dampers of a heating-furnace, by a combination of clock work and electro-magnets, connected with a metallic thermometer, which closes either one of two circuits at any desired temperature, thus allowing the clock-work to open and close the dampers, and increase or diminish the draught.

The Consolidated Electric-Light Company of New York, has a pretty little cottage, which they intend to light with incandescent lamps very soon, and their dynamo-machine is now in position in the basement. Indeed, the dynamo-machines of all the lighting companies at the exhibition may be seen there in full operation at any time after dark. Taken as a whole, the exhibition is a good one, and shows forcibly the advance in electrical work during recent years.

F. Elliot Cabot.

LASGIRD, THE CURIOUS.

We had not proceeded far on our way when vestiges of the former condition of things met our eyes. It was at a place only one hundred miles from Teheran that we first realized the dreadful state of danger in which the people had lived. We found a most remarkable village at which we encamped. Supposing no information could have been procured, and an archæologist had come upon it by accident, he would have had a profound puzzle to unravel and explain. The name of the village is Lasgird. The people ascribe an immense antiquity to it, and say that Las, or Last, a son of Noah, drew on the ground the "gird," or circle, which is the plan of the structure. The hero of this legend is not very familiar to Biblical scholars in the west, but he is not unknown in Afghanistan. The Colosseum at Rome, although an oval, would convey some idea of the general appearance of Lasgird, only it must be conceived as built of mud, which is almost the only building material of this country. It should also be recollected that the one belongs to a period of good architecture, of which it is a celebrated monument, while the other may be said to be entirely destitute of any pretensions of this kind.

The rude mud walls are thick and solid all round at the base, and rise some thirty or forty feet, where there is a line of doors, with here and there a small window between them. By means of projecting beams, or branches of trees, over which smaller branches are laid, a kind of gallery is produced, bearing a strong resemblance to those simple forms of birds' nests which are formed of sticks placed on the upper branches of trees. The wonder is how the eggs do not roll over, or that the chicks do not tumble down to destruction. So it is with the galleries of Lasgird: there is no protection on the edge. Yet we saw women and children, sheep and goats upon them. A more frail and dangerous-looking arrangement it would be hard to conceive. There are two tiers of houses all round, and in some places there appeared to be three. All had these galleries in front, either to communicate with the next house, or, as some did not communicate, they were only of use to come out upon to sit or work, or for the children to play upon. To us these places seemed the brink of destruction, while to the women and children it all appeared as safe and comfortable as if they had been monkeys. Of course there was no getting up to these galleries from the outside; that would have suited the Turcomans. The means of going up was all on the inside. In some cases there are rough steps of mud, and in others there are inclined planes, half ladder and half road, made in the same way as the galleries. These lead up to galleries communicating with the houses, which were an exact repetition of those on the outside, the only difference being that they were not so high up, and there were walls at places which did duty as a parapet, hence the certainty of falling over did not seem quite so great from the inside as on the outside. While looking at this strange structure from one of these upper galleries, an old woman of at least seventy years of age passed me with a child stuck in some primitive way on her back. A few yards from me was one of these means of ascent, formed of sticks, with the remains of mud hanging to it; it would have done for fowls to go up to their roosts upon. She clambered up on this to the gallery above, but that was not her destination; her house was one up still higher in a corner, and to reach it she had to crawl up on the edge of a crumbling mud wall not above eighteen inches wide. On her left hand was a perpendicular descent, enough to make any one dizzy, and death at the bottom of it if a fall should occur; although on the other side there was only a few feet, if the old creature had slipped, the chances are she would have rolled down and fallen over the gallery with the baby on her back. The old lady went up very steadily, and reached her crow's nest in perfect safety. I could not help thinking that a few generations of this kind of thing would undo all our development, and that we would go back again to our original simian condition.

The dwellings of the people were all in the upper part of the great circle, and the centre was filled up with strange moss structures, which are now falling to decay, as there is no longer any danger from the Turcomans. These places were for containing the grain of the village, and for receiving the live stock of the villagers when a raid occurred. One of a number of wells was pointed out to us within the circle, and we were told that they had three or four which were always kept in good order in the days of danger. There is only one entrance to this circle, and that is by a small entrance scarcely four feet in height, to which there is a stone door working with a pivot and socket similar to the ancient stone doors found in the Hauran and other parts east of the Soudan. This stone door of Lasgird is a very rude one, being eight inches thick in some parts, and it tells its tale of the existence of great danger and the necessity for protection. Sir Peter Lumsden had a long conversation with the Khet Khodah and some of the principal villagers, and it seemed that they not only ascribed the origin of Lasgird to the son of Noah, "Nu," as they called him, but they likened their strange dwelling-place to the ark. Extreme theologians, who identify the church with the ark, say all who were in the ark were saved; all without were destroyed. This was exactly the case with Lasgird. When a chupao took place, all who got in were secure; all who were left outside became victims. A chronic state of war existed, and this fortified village was the result. The Government either could not or would not defend the people, and they had to take means for their own safety. — *Letter from Persia to the London Daily News.*

STABLE CONSTRUCTION.[1]

The United States Census of 1870, gave the number of horses owned in the United States, as 8,690,219. When the Census of 1880 was taken there were 12,170,296 horses, mules, and asses on the farms alone. Our own State of Illinois leads with 1,146,360!

Anything affecting the monetary value of this vast multitude is of importance to the individual owner, to the State wherein he resides, to the nation of which he is a citizen!

We appeal in vain to history to inform us when mankind first subjected this, the most noble of the brute creation, to his service in times of peace, and times of war! The date is lost even to tradition, but that he served in the dawn of mankind, the sublime words of Job bear witness.

"Hast thou given the horse strength? Hast thou clothed his neck with thunder? Canst thou make him afraid as a grasshopper? The glory of his nostrils is terrible. He paweth in the valley, and rejoiceth in his strength; he goeth on to meet the armed men. He mocketh at fear, and is not affrighted; neither turneth he back from the sword."

Prescott tells us of his service with the Spaniards in their conquest of Mexico. In short, the debt of humanity to this noble animal cannot be overestimated, and every language has been used to sing his praise!

The artificial restraint imposed upon the horse by mankind during so many centuries past has had its effect, and he resembles his master in many diseases.

[1] A paper read July 15, 1881, by Augustine W. Wright, Member Western Society of Engineers.

From a sanitary point of view late years have witnessed great advancement in the construction of buildings for mankind, and the cry for better stable accommodations has not been uttered entirely in vain.

Permit me to quote a few from the many writers upon this important subject.

John Stewart wrote: "Stables have been in use for several hundred years. It might be expected that the experience of so many generations would have rendered them perfect. They are better than they were some time ago. . . . A damp stable produces more evil than a damp house. . . . Since 1788, when James Clarke's work was published protesting against close stables, there has been a constant outcry against hot, foul stables. Every veterinary writer who has had to treat of diseases has blamed the hot stables for producing at least one-half of them." Jennings wrote: "The most desirable thing in a stable is ventilation. A horse requires air equally with his master; and as the latter requires a chimney to his sleeping room, so does the former." Henry W. Herbert, better known as Frank Forrester, wrote: "In a climate so uncertain, changeful, and in which the extremes of heat and cold lie so far apart, as in this country, the question of stabling is one of paramount importance. The stable, to be of real utility, must be perfectly cool, airy, and pervious to the atmosphere in summer; perfectly close, warm, and free from all drafts of external air, except in so far as shall be needed for ventilation, in winter; perfectly ventilated, so as to be pure and free from ill odors, ammoniacal vapors and the like arising from the urine and excrement of the animals, at all times perfectly dry under foot, and well drained, since nothing is more injurious to the horse than to stand up to its heels in wet litter. . . . Lastly, it should be perfectly well lighted, as well as thoroughly aired."

Stonehenge wrote: "The horse, like all the higher animals, requires a constant supply of pure air to renovate his blood, and yet it must not be admitted in a strong draught, blowing directly upon him, or it will chill the surface, and give him cold. . . . By common consent it is allowed that no stable divided into stalls should give to each horse less than 800 or 1,000 cubic feet."

Youatt wrote: "It is not generally known, as it should be, that the return to a hot stable is quite as dangerous as the change from a heated atmosphere to a cold and biting air. . . . It is the *sudden* change of temperature, whether from heat to cold or from cold to heat, that does the mischief, and yearly destroys a multitude of horses."

One more quotation from John Osgood, who, in speaking of city stables, said: "Now, in the name of humanity and ordinary commercial thrift and sagacity, let this be stopped. There is no reason why stables should be horse hells! No reason why they should vie with 'The Black Hole' in their inevitable cruelty, and gloom, and destruction. These and city stables generally (with some exceptions) are a disgrace and a shame to a civilized community. So long as they continue as they now are, horses must die. There are no remedies for the sudden and violent diseases which will attend such poisonous air, and water, and food. The remedy lies in providing ample and well-ventilated stables — stables well lighted, with stalls of ample dimensions, with escape pipes for the ammoniacal effluvia which arises from so many animals and their excretions, with more room for evaporations; and then the chances would no longer be against every horse who passes through these doors, as they were against those ghastly ones who passed through Dante's gate, and as they went in, read above their heads:

'Who passes here goes into everlasting hell.'

"Improve the stables, then, and prevent disease. . . . Do not insult a respectable animal who has come from the country to do his share of the work of the world, and has brought with him the memory of the sweet hills and skies, at least, by immuring him in one of those cramped, rickety, rotten, stinking, slovenly, damp dungeons, where a dumb beast would lose his self-respect and his courage beneath an oppressive weight of miasmas, and hideous, gloomy, nasty confusion. Stop this, or pray that horses may die ere the evil days come."

The above, if it have weight, must convince you that badly-constructed stables are responsible for many, very many, of the diseases among horses. The paramount importance of abundant sunlight, perfect sewerage, and good ventilation is now, fortunately, recognized almost universally in building human habitations, but how often ignored in providing quarters for the horse, the number sick and unfit for duty most eloquently testifies.

I will now describe a stable just finished for the North Chicago City Railway. It fronts south 125 feet upon Belden Avenue, east 238 feet upon Jay Street, both of which streets are 66 feet wide. Along the west side there is an alley 16 feet wide, and 50 feet left vacant, extending to the car-house. On the north our property extends 12 feet beyond the stable. We therefore have light and ventilation upon four sides. The horses face north and south. In the rear of each row of horses there is an alley extending clear across the stable, 10 feet wide, with a sash door 7′ x 10′ at each end. Another alley 9 feet 6 inches wide extends the length of the stable at right angles to the former, with sash doors 7′ x 10′ at each end. The stalls are 9 feet deep, and each horse is allowed 56 inches of width. Double stalls are, in my opinion, the best, when horses will stand quietly together. So many of our horses will not do this, that I alternate two single stalls with one double stall, thus allowing the foreman to place the horses who will not stand quietly in single stalls. The floor of this stable consists of 4 inches of asphalt with 2″ x 4″ scantling bedded therein, 16-inch centres, to which the wearing floor of 2-inch pine is spiked. The stalls have an inclination of 2 inches, terminating in a gutter connected with the sewer. These gutters are covered with cast-iron plates 56 inches long by 6 inches wide, perforated to allow the urine to pass into the gutter. These covers are moveable, and at least once a week the foreman of the stable sees that they are taken up, and that the gutters are thoroughly cleaned. Some disinfectant should be freely used. Between each row of horses there is a "feed-alley" 4 feet wide. By this construction the horses are not brought head to head to breathe each the other's breath, contaminated, it may be, by disease which is thus spread from one to another. No food is wasted in placing it in the manger; and there is less danger of an employé being injured, or perchance crippled for life by some vicious or frightened horse. At each end of these feed-alleys windows are placed containing 32 lights, 9″ x 14″, a size of glass I have adopted as a standard and use whenever possible, to avoid carrying a stock of different sizes. In these feed-alleys, beneath the floor, there are placed fresh-air ducts, extending from outside to outside of the stable, through which air is admitted, passing out into the stable through perforations in the cover, thus avoiding injurious draughts. Its exterior openings are protected by cast-iron grates built in the brickwork, preventing the entrance of all vermin, and especially the pestiferous rat! In this stable there are nine ventilators, one located at the intersection of all alleys, for the exit of foul air. They are 6′ x 6′ at the lower end, and taper to 4′ x 4′ at the top, extending 8 feet above the roof. The four sides above the roof are movable (except the posts), inclining at an angle of 45°, thus deflecting the air upward and doing away with all downward currents, and permitting the opening to be reduced in cold or inclement weather, ropes extending to the ground floor for this purpose. We are indebted to the veteran in horse-railroad matters, John Stephenson, for this admirable idea. It resulted from many experiments made by him upon ventilation while a member of the New York School Board. The gas-burners located under these ventilators assist in ventilation by heating the air, which ascends and increases the outward-bound current of impure air.

The first story of this stable is 16 feet high, second story 7 feet at walls, and 9 at centre. Each horse has twelve hundred and sixteen cubic feet of space, an amount fully equal to modern theoretical requirements. The hay-loft can contain one year's supply, if needed. The feed department, with bins for storage, troughs 16 feet long, 4 feet high, and 3 to 4 feet wide for mixing feed, cut-hay room and horse-power to run the cutter is located upstairs. As we use shavings for bedding and can obtain them cheaply and abundantly in summer when the mills are busy, whereas they are scarce and high in winter, the bedding room is large. On the ground floor it is 16′ x 50′, and extends open to the roof, with an addition, 16′ x 70′ on the second floor. The cost of bedding for the horses purchased in this way is one-half cent per diem each.

The hospital, separated from the balance of the stable, is located at the north end, in the most quiet spot. Scales are provided upon which all supplies are weighed. An office for the foremen, room for grooms, another for conductors, and one for storage, are furnished, besides convenient closets, etc. I neglected to state that a number of catch-basins are provided to retain all shavings and solid matter that might otherwise get into and obstruct the sewer-pipes. These basins are 4 feet in diameter, and are cleaned out as often as may be necessary. They are trapped to prevent sewer-gas from entering the stable; all the roof water is used to flush these sewers. The building will be whitewashed in the fall, for health and comfort.

The above brief description will serve to give you an idea as to how far I have succeeded in putting in practice the requirements of theory. The stable has abundance of fresh air, contaminated air is removed, and there is good sewerage and plenty of light. The small percentage of horses in our hospitals most emphatically indorses the construction.

I think with Youatt that the stable should not be too warm in winter. Nature is a safe guide, and she provides the horse with a suitable covering. The stable temperature in my opinion should not vary more than 10 or 20 degrees from the external air. Keep the stable cool, and, if necessary, throw a blanket over a horse while hot, just in from work, during severe winter weather. Our car horses pass twenty of the twenty-four hours in the stable, and the importance of thorough sanitary arrangements is, of course, thereby increased, as the majority of horses used in other lines of business spend scarcely more than one-third as much time in the stable.

"A merciful man is merciful unto his beast," but the most refined selfishness, if intelligent, should cause each and every one with capital invested in horse-flesh to give it "suitable stable accommodations." Were my pen capable of expressing all I feel, most eloquent would be my appeal in behalf of the noble brute for whom I have ever entertained the deepest affection.

A UNIVERSAL MONUMENT.—A committee has been formed at Lucerne with a view to erecting what is called a "universal column." It is to measure 300 feet in height, and is to contain in its interior bronze bas-relief portraits of all the celebrated men and women of the present era. Another project of the committee is the building of a "museum of the nineteenth century," to be dedicated to art, science, inventions, commerce, industry, and to contain the busts and statues of all distinguished persons of these domains. The cost is estimated at 7,000,000 to 8,000,000 francs, and is to be met by subscription, lotteries, etc.—*Chicago Evening Journal.*

NOTES AND CLIPPINGS.

Pneumatic Postal-Service at Paris. — The organization of the pneumatic postal-service throughout Paris, which has lately been completed, has cost more than a million francs, and the length of the pipes is over thirty-four miles. This elaborate work was begun by M. de Couchy, who was director of French telegraphs under the empire seventeen years ago. The charge for transmitting a letter to any place within the fortification has been fixed at six sous. The service covers extreme points about seven miles apart. Under the most unfavorable circumstances a letter will be delivered to the remotest place, including its conveyance from the nearest station, within one hour. The saving of time and labor by the pneumatic postal service is expected to result in its adoption in other European capitals.—*Exchange.*

The Nouvel Opera, Paris.—Parisians being proverbially fickle, it is not surprising that they have grown tired of the Opera House, which is so important a landmark in the city, and are wishful that they could recover the old house in the Rue le Peletier. M. Garnier's grandiose building does not pay, and there has been difficulty in finding a manager to succeed the unhappy M. Vaucorbeil. Two gentlemen have now undertaken the office. It has been suggested that the building should be demolished, and the site appropriated to some other purpose. The area is 11,237 square metres, and at 11,000 francs per metre the ground would be worth 33,711,000 francs. To this should be added the value of the materials, the sculpture and mosaics. The group of dancers would probably secure a high price from its notoriety. A new opera-house could then be constructed by the State. It may be noted, however, as an indication of the modern spirit, that it is gravely recommended to erect the building without calling in the aid of an architect. One of the causes of the change in feeling towards the Opera House may be the fear of the consequences of having a large number of unemployed men. There is a pressing need of work in the building trades in Paris. It was lately said in the chamber that two years ago there were 100,000 masons in Paris, while at present there are only 70,000, of whom one-half are without employment.—*The Architect.*

An Experiment in Lumber-Drying.— An interesting experiment in drying timber, made by the Stephenson Car Company of New York, some years ago, is detailed in the *National Car Builder*. It became necessary to devise some method of seasoning that should be quick, and an apparatus which should be able to handle a considerable quantity of it in a short time. The plan which was suggested was the application of dry steam in direct contact with the wood. Furnaces were at once erected, and preparations made for the work. When the lumber first came from the furnace, it was as bright and handsome as could be desired. The steam was used at a pressure of 250 pounds per square inch. On opening the sticks, the timber was found to have been completely ruined. The whole interior had practically been converted into charcoal, so that it could be crumbled in the fingers, and was of brownish black color. Even so small a stick as an army wagon spoke would have its centre portion so destroyed as to leave cracks of one-third of an inch running through it, while the surface exposed to the direct contact of the steam was apparently bright and sound. This, of course, put an end to all attempts to dry the oak by the use of high-pressure steam, and they finally adopted a heat of about 150° Fahrenheit as a maximum. With this they were enabled in three or four days to remove 400 pounds of water from a ton of green oak. An idea has been generally prevalent that lumber dried by artificial heat loses something of its strength by the process. Just what this loss is, or how it affected the lumber, is not so generally known. The experiment detailed, however, shows that it is a carbonizing process, which can go on at low temperature, and this harmonizes completely with Count Rumford's experiments. He succeeded in completely charring thin shavings of beechwood, with a temperature, we believe, below 212°.—*Springfield Republican.*

Nankin's Porcelain Tower.—The city of Nankin, once the capital of China, has for centuries been famous to the "barbarians" of the outer world for its Porcelain Tower, a relic of the splendor of its ancient days, before Pekin usurped its dignity as the seat of the empire. The place is now to a great extent a city of ruins, and the city proper has shrunk to one-fourth of its former dimensions. The Porcelain Tower was built early in the fifteenth century, by the order of the Emperor Yung Loh, and as a work of filial piety. It was a monument to the memory of his mother, and he determined that its beauty should as far outshine that of any similar memorial as the transcendent virtues of the parent, in her son's eyes, surpassed those of the rest of her sex. No expense was spared in its erection, and its total cost is estimated at more than three-quarters of a million of our own money. The work was commenced at noon on a certain day in 1413, and occupied nearly twenty years in its completion. The total height of the Porcelain Tower was more than two hundred feet, or about equal to that of the monument of London, and it was faced from top to bottom with the finest porcelain, glazed and colored. It consisted of nine stories, surmounted by a spire, on the summit of which was a ball of brass, richly gilt. From this ball eight iron chains extended to as many projecting points of the roof, and from each chain was suspended a bell, which hung over the face of the tower. The same arrangement was carried out in every story. These bells added much to the graceful appearance of the tower, breaking its otherwise formal and monotonous outline. Round the outer face of each story were several apertures for lanterns, and when these were all illuminated, we are told, in the magnificent language of the Chinese historian, that "their light illuminated the entire heavens, shining into the hearts of men, and eternally removing human misery!" It is not difficult to imagine, however, that the appearance of the tower on such an occasion must have been beautiful in the extreme. On the top of the tower were placed two large brazen vessels and a bowl, which together contained various costly articles, in the nature of an offering and a charm to avert evil influences. Among these were several pearls of various colors, each supposed to possess miraculous properties, together with other precious stones and a quantity of gold and silver. In this collection, designed to represent the best treasures of the State, were also placed a box of tea, some pieces of silk, and copies of some ancient Chinese writings. The tower was demolished by the Taiping rebels in 1853.—*The World of Wonders.*

A Painter's Story.—The *Figaro* tells an amusing story of the tricks of the trade in pictures. A broker named D—— had signed a contract with a poor member of the brush, to take all the latter could produce; the consideration being two francs an hour! The line of the painter was military subjects. As soon as he had finished a painting, the broker took it away, changed the signature to that of "A. E. Gaubault," and sold it at a handsome profit. The consequence was that while the poor artist slaved during ten hours of the day at the rate of two francs an hour, and remained unknown to any but the rascally broker, the fame of "Gaubault" kept rising apace, and his pictures fetched higher prices every year. The painter happening to stroll into the Salon one day, recognized his handiwork, but not the signatures appended. Consulting his catalogue, he discovered "Gaubault's" address at the rooms of M. Bernheim, the well-known dealer in the Rue Maffite. Hastening there he introduced himself to the dealer as "Gaubault." "Ah," exclaimed M. Bernheim, "I congratulate you; you have achieved wonderful success. I have been wishing to make your acquaintance for the past six years." "Oh," replied the artist, "but my name is not 'Gaubault,' but Beauquesne," and he forthwith acquainted the dealer with his little contract with D——. Since then the latter has vanished, and Beauquesne signs the canvases which made his pseudonym famous, and which in turn brought him to the notice of those who had been admiring them at the Salon for the past three years.—*Galignani.*

Bessemer Steel Works in the United States. — There are twenty-one Bessemer steel works in the United States, and one in process of building. These twenty-one works contain forty-six converters, and three converters are building. The total annual capacity of the works completed is 2,490,000 net tons of ingots. The plant building is that of the Benwood Iron Works, at Benwood, W. Va. The States that have Bessemer works are: Massachusetts, one, with two four-ton converters; New York, one, with two seven-ton converters: Pennsylvania, nine, with twenty-two converters, and one building, ranging in size from two-ton to ten-ton; West Virginia, one, with two five-ton converters, and one building, which will have two four-ton converters; Ohio, three, with five converters, ranging in size from four-ton to ten-ton; Illinois, four, with nine converters, ranging from six-ton to ten-ton; Missouri, one, with two seven-ton converters; Colorado one, with two five-ton converters. The first Bessemer plant in the United States was erected in Troy, N. Y., and made its first blow February 15, 1865; the second was erected at Steelton, Pa, and made its first blow June, 1867; the third was erected in Cleveland, O., which made its first blow October 15, 1868. The largest Bessemer plant in the United States is that at Steelton, Pa., which contains two seven-ton and three eight-ton converters. The next largest are the Edgar Thompson, at Pittsburgh, and the North Chicago, at Chicago, which have three ten-ton converters. The domestic works are now more than able to supply all domestic demands for Bessemer steel, and one of them recently received a 10,000-ton order from Canada for rails.—*Scientific American.*

The Mezzotint Process.—The principle on which the process of mezzotint is founded, and the process itself, may be thus described: A plate of bright copper or steel is "rocked" backward and forward, and in all directions by a tool having a sharp serrated edge till its whole surface is indented and torn up. A sort of warp-and-woof pattern is thus produced upon it, while a pile like that of velvet is thrown up and evenly distributed over its whole surface. This pile, if charged with printers' ink, would print black; the pile removed by a "scraper," and the warp-and-woof pattern laid bare, the plate would print gray; the warp-and-woof pattern itself removed, white — because the plain surface of the plate would again be reached. If, however, instead of removing the whole of the pile only half of it be removed, a tint is obtained half-way between black and gray — a mezzotint. The art, therefore, of the mezzotint engraver consists in scraping away the metallic pile and in removing so much of the warp-and-woof pattern beneath it as he may find necessary to obtain the exact tints or tones he requires, and his skill lies in the precise value which he is able to give to each of these tones and tints. The instruments necessary to the purpose are three—a "rocker," or "cradle," with which to lay the ground; a sharp knife, or "scraper," with which to cut away the pile, and a burnisher with which to remove partially or entirely the warp-and-woof pattern below it. There is, however, no hard-and-fast rule as to the exact fashion of these instruments, or even as to the method of using them, the earliest mezzotinters having had recourse to a variety of methods for "laying their grounds." Thus Claude, who, like Rembrandt, seems to have heard of the process and tried it on one of his etched plates, rubbed its surface with pumice-stone, and then burnished away the tint produced by it; Evendingen used a process which the nature of his work does not render very obvious: Rembrandt employed the etching needle itself in such a way as to throw up with its point as much of the pile, or "burr," as he required; Siegen had a method of his own, which produced an effect not unlike "stipple" (a mode of engraving previously in use); Rupert, whose work is singularly fine and painter-like, was contented to ground his plate as he went on, and in the degree necessary to each part of it, by the action of the burin or dry point with which he was actually working, his principle being not unlike that of Rembrandt. Turner obtained his color sometimes by the roulette, as in the etching of "Kirtstall Abbey," and sometimes, as in "The Calm," by a granulated substratum analogous to the warp-and-woof pattern, produced by what is called "soft ground etching." Others again used special tools to obtain the effect of different tissues — a rocker with a plain chisel-like edge, for instance, for silken materials, a tool with a serrated edge for grosser texture, and so on. Altogether, therefore, it will be seen that in the hands of a man of genius the *modus operandi* of mezzotint admits of considerable variety, while this very latitude of procedure renders it again peculiarly a painter's art. — *Seymour Haden in Harper's Magazine.*

GELATINE EDITION.

During the year 1885 a series of Gelatine Prints, (Heliotypes) photographed from the natural object, will be published in the AMERICAN ARCHITECT AND BUILDING NEWS.

These gelatine prints will be issued once a month to those subscribers only who will pay a dollar extra for the twelve prints.

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IMPORTANT NOTICES.

IT will greatly simplify our book-keeping and prevent future complaint, if those of our present subscribers who (having already paid to various dates of 1885) wish to receive the gelatine plates will make their remittances cover the *entire* year to January 1, 1886, by remitting at the rate of fifty cents for each remaining month, in addition to the dollar for the gelatine prints.

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ADVERTISERS, whose contracts run through the entire year, receiving the *American Architect* free can secure the gelatine plates by remitting $1.00 for the entire year.

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[*Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.*]

BUILDING PATENTS.

[*Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.*]

309,300. Sash-Holder. — James F. Hamilton, Connersville, Ind.

309,313. Auger-Handle. — William A. Peck, Roe, Mass.

309,328. Process of Slaking Lime. — William I. Adams, Baltimore, Md.

309,330. Self-closing Hatchway. — Philip V. Bail, Cowden, Ill.

309,339. Planing and Matching Machine.—Wm. M. Dwight, Detroit, Mich.

309,351. Well for Slop-Buckets.—Frank Menke and Joseph Kroll, St. Louis, Mo.

309,363. Apparatus for painting Wire-Screens. Chas. J. Shipley, Detroit, Mich.

309,367. Brick-Machine.—Josl Tiffany, Hinsdale, Ill.

309,388. Saw-Handle. — William H. Hankin, Jr., Brooklyn, N. Y.

309,389. Wrench. — William P. Heffron, Chicago, Ill.

309,393. Hinge. — John H. Lawrence, Sterling, Ill.

309,395. Trap.— Ezra S. McClellan, Paterson, N. J.

309,400. Joiner's Plane.—George D. Mosher, Birmingham, Conn.

309,413. Weather-Strip. — Jacob J. Smith and Frank H. Schwartz, Lima, O.

309,435. Ladder-Bracket.— John R. Bodell, New Salem, O.

309,436. Boiler for Heating Purposes.—Henry Burt, Danforth, N. Y.

309,438. Tool-Handle. — Cyrus Carleton, Providence, R. I.

309,449. Elevator. — Walter L. Folstead, Richmond, Va.

309,459. Metallic Roofing. — Millard F. Hamsley, Nashville, Tenn.

309,472. Roofing-Machine. — Henry A. Leher, Cape Girardeau, Mo.

309,490. Fire and Water Proof Roofing-Paint. —Charles H. Phillips and Wallace M. Taylor, Alpena, Mich.

309,495. Hot-Air Furnace.—David McCreary Russell, Washington, D. C.

309,527. Fire-Escape. — G. Van Ness Covert, Farmer Village, N. Y.

309,538. Screw-Elevator. — Lorenzo S. Graves, Rochester, N. Y.

309,545. Fire-Escape.— Otto Hirt, Carlsbad, Austria-Hungary.

309,549. Brick-Machine. — Joseph J. Kulage, St. Louis, Mo.

309,550. Saw.—Joseph Ledward, Westerly, R. I.

309,551. Tin-seaming Machine. — William A. List, Wheeling W. Va.

309,568. Roofing-Tile and Apparatus for the Manufacture thereof. — Carl Schlickeysen, Berlin, Germany.

309,580. Weather-Strip. — George W. Snyder, Western College, Io.

309,586. Artificial Stone or Building-Block and Process of making the same.—Otto J. E. Vogelbach and John Christian Wieland, Philadelphia, Pa.

309,589. Brick-Machine. — Geo. J. Weber, Boonville, Mo.

309,599. Trans m-Lifter — Augustus R. Brand, Philadelphia, Pa.

309,601. Combined Door-Knob and Button. — Mary Broughton, Brooklyn, N. Y.

SUMMARY OF THE WEEK.

Baltimore.

Building Permits. — Since our last report but one permit has been granted, which is not of sufficient importance to note.

Brooklyn.

Building Permits. — *Hull St.*, n s, 150′ w Hopkinson Ave., 2 two-st'y frame dwells., tin roofs; cost, each, $2,200; owner and architect, Baldwin Pettit, 289 Chauncey St.; builders, Ernst Sutterline and J. Collins.

Macon St., s s, 66′ w Hopkinson Ave., 3 two-st'y brick dwell., gravel roofs; cost, each, $3,000; owner and builder, James G. Porter, 405 Pearl St., New York; architect, Thomas S. Godwin.

Meserole Ave., n s, 150′ e Lorimer St., one-st'y frame skating-rink, gravel roof; cost, $3,000; owner, Elliott & Co., Flatbush, L. I.; architect and builder, Stephen M. Randall.

Evergreen Ave., e s, 55′ n Bleecker St., two-st'y frame (brick-filled) dwell., tin roof; cost, $3,000; owner and builder, Ernst Loerch, 61 Himrod St.; architect, Th. Engelhardt.

Greene Ave., n s, 400′ e Nostrand Ave., 3 three-st'y brown-stone dwells., tin roofs; cost, each, abt. $8,000; owner, Lewis B. Reed, Mansion House, Brooklyn; architect and builder, Geo. H. Stone.

Lexington Ave., n s, 100′ e Bedford Ave., 15 two-st'y brick dwells., tin roofs; cost, each, $4,000; owner, T. H. Robbins, Keyport, N. J.; architect, Amzi Hill; builder, E. K. Robbins.

Lee Ave., n w cor. Middleton St., one-st'y frame skating-rink, cement roof; cost, $3,000; owners, Hegnell & Wood, 57 Lynch St.; architect, E. F. Gaylor; builder, not selected.

St. Mark's Pl., late Wyckoff St., n s, 69′ e Fourth Ave., three-st'y brick dwell., tin roof, wooden cornice; cost, $5,000; owner, H. S. Stewart, on premises; architect, R. Dixon; builder, J. H. Woolley.

Locust St., n s, 125′ e Broadway, three-st'y frame tenement, tin roof; cost, $4,500; owner, Henry Hoffman, 135 Leonard St.; architect, F. Holmberg.

De Kalb Ave., No. 1356, s s, 250′ w Hamburg Ave., five-st'y frame tenement, tin roof; cost, $4,300; owner and builder, Fred. Stemler, Suydam St., near Myrtle Ave.; architect, F. Holmberg.

North Fourth St., No. 81, n s, 175′ w Third St., three-st'y brick tenement, tin roof, iron cornice; cost, $5,500; owner and builder, Wm. S. Collins, 81 North Fourth St.; architect, A. Herbert.

Bremen St., Nos. 29 *and* 31, w s, 150′ n Adams St., two-st'y brick ice-house, tin roof; cost, $7,000; owners, Danenberger & Co.; architect, Charles Stoll.

Suydam St., s s, 380′ e Broadway, two-st'y (brick-filled) dwell., tin roof; cost, $4,000; owner and builder, Tereesa Lanzer, 11 Suydam St.; architect, John Herr.

Cedar St., s s, 86′ 4″ n Myrtle Ave., 2 three-st'y frame (brick-filled) tenements, tin roofs; cost, each, $3,500; owner and builder, Fr. Herr, 778 Broadway; architect, John Herr.

Nassau Ave., s s, 30′ e Lorimer St., 5 three-st'y frame (brick-filled) tenements, gravel roofs; cost, each, $2,500; owners, architects and carpenters, Randall & Miller, 68 Nassau Ave.; mason, —— Van Riper.

Van Cott Ave., n w cor. Oakland St., three-st'y frame (brick-filled) store and tenement, tin roof; cost, $5,600; owners, Roeden & Kollmann, n e cor. Van Cott Ave. and Oakland St.; architect, Fred. Weber; builders, Martin Vogel and Thos. Kepple.

Vernon Ave., Nos. 285-291, n s, 125′ e Sumner Ave., 2 five and four st'y brick and stone brewery and ice-house, tin roof, brick cornice; cost, $60,000; owner, Ferdinand Munch, 283 Vernon Ave.; architect, Charles Stoll; builders, John Auer and John Rueger.

Harman St., n s, 80′ w Central Ave., 10 two-st'y frame (brick-filled) dwells., tin roofs; cost, each, $2,700; owners, etc., Cozine & Gascoine, 307 Evergreen Ave.

Alterations. — *Willoughby St.*, n w cor. Bridge St., one-st'y brick extension, gravel roof; cost, $3,000; owner, P. A. Panier, on premises; architect, C. F. Eisenach; builder, W. Zang.

Pacific St., s w cor. Henry St., add two-st'y, also three-st'y brick extension, tin roof; iron cornice; cost, $13,000; owner, Long Island College Hospital; architect, W. B. Tubby; builders, James Ashfield & Son and Martin & Lee.

Chicago.

Building Permits: —Indiana Club, additional story, 3349 Indiana Ave.; cost, $3,500.

Allen Pinkerton Estate, 3 two-st'y dwells., 533 to 537 West Monroe St.; cost, $15,000; architects, Treat & Foltz; builder, E. Sturtevant.

F. Bigdon, two-st'y flats, 97 Laflin St.; cost, $4,000.

Mrs. M. Willeys, two-st'y dwell., 2313 Washington St.; cost, $4,000.

M. Flemming, three-st'y store and flats, 308 Blue Island Ave.; cost, $7,000; architect, F. Keltinech, builder, N. Provost.

C. Watrons, four-st'y flats, 312 and 314 North State St.; cost, $15,000; architects, Frommann & Jebson; builder, A. Carlson.

F. W. Campbell, 3 three-st'y dwells., 487 and 489 Jackson St.; cost, $15,000; architects, Edbrooke & Burnham; builders, Campbell Bros. & Co.

J. W. Brooks, two-st'y dwell., 966 Jackson St.; cost, $5,000; architects, Edbrooke & Burnham; builders, Campbell Bros. & Co.

J. W. Brooks, 2 three-st'y stores and flats, 879 and 881 Polk St.; cost, $16,000; architects, Edbrooke & Burnham.

H. Copeland, 7 two-st'y dwells., Flourney St., cor. Hoyne Ave.; cost, $16,000; architect, H. Copeland; builder, Wilkie.

New York.

Houses. — Mr. Edward Kilpatrick proposes to build 4 four-st'y brown-stone houses, on the n w corner of Madison Ave. and Eightieth St.

Mr. Wm. H. Hays will build a number of houses on Ninety-second and Ninety-third Sts., bet. Ninth and Tenth Aves., all from designs of Messrs. D. & J. Jardine.

Flats. — For Messrs. Wm. and Philip Ebling, 5 five-st'y brown-stone flats and stores, are to be built on the n e cor. of First Ave. and Seventy-second St., at a cost of $70,000; from designs of Mr. Anthony Pfund.

For Mr. Peter Uhlein, 2 five-st'y brick and brown-stone tenements and stores are to be built on the e s of First Ave., bet. Eighty-eighth and Eighty-ninth Sts., at a cost of $28,000; from plans of Mr. John Brandt.

Factory. — On the s s of Thirty-first St., 175′ w of First Ave., a 50′ front piano factory is to be built by Messrs. Stultz & Bauer.

Building Permits.—*Pitt St., No.* 12, five-st'y brown-stone tenement, tin roof; cost, $18,000; owner, Chas. Boswald, 73 Ludlow St.; architect, W. Graul.

Seventy-fifth St., s s, 100′ w Boulevard, 5 three-st'y brick and stone dwells., tin roofs; cost, each, $16,000; owner, Daniel D. Brandt, 38 Bank St.; architect and builder, Wm. J. Merritt.

Third Ave., No. 2039, three-st'y brown-stone front store and club-room, tin or gravel roof; cost, $7,000; owner, Henry Budelman, Jr., 117 East One Hundred and Eleventh St.; architect, A. E. Fountain.

East Twenty-fourth St., Nos. 337 *and* 339 2 five-st'y brick tenements, tin roofs; cost, each, $18,000; owner and builder, John Fish, 97½ Ninth St.; architect, Richard Berger.

East Eighty-second St., No. 310, s s, 150′ e Second Ave., one-st'y brick factory and stable, tin roof; cost, $2,500; owner, Wm. E. Seitz, 431 West Twenty-eighth St.; architect, A. E. Hudson; builder, John J. Kierst.

Willis Ave., n e cor. One Hundred and Forty-eighth St., three-st'y brick refrigerator, office and tenement, tin roof; cost, $12,000; owner, Edwin C. Swift, Lowell, Mass.; architect, F. Miller; builder, B. F. Bailey.

Second Ave., s w cor. One Hundred and Fifteenth St., five-st'y brick store and tenement, tin roof; cost, $20,000; owner and builder, John Walker, 233 East One Hundred and Thirteenth St.; architect, J. H. Valentine.

Second Ave., w s, 22′ s One Hundred and Fifteenth St., 2 five-st'y brick stores and tenements, tin roofs; cost, each, $20,000; owner, architect and builder, same as last.

Pitt St., No. 14, five-st'y brown-stone tenement, tin roof; cost, $18,000; owner, Hermann Von Natzmer, 57 East Seventh St.; architect, Wm. Graul.

Southern Boulevard, n e cor. Hull Ave., two-st'y frame dwell., shingle roof; cost, $6,000; owner, D. R. Kendall, President and Treasurer, 111 Broadway; architect, A. Marsh; builders, J. V. Hedden & Son.

One Hundred and Forty-third St., Nos. 691-697, n s, 300′ e Willis Ave., 4 two-st'y and basement brick dwells., tin roofs; cost, each, $4,000; owner, Charles Van Riper, 683 East One Hundred and Forty-third St.; architect, H. S. Baker.

Sixty-sixth St., s s, 75′ w Ave. A, 7 five-st'y brick tenements, tin roofs; cost, each, $15,000; owner, Frank R. Crumbie, Nyack, N. Y.; architect, J. H. Valentine.

One Hundred and Seventy-fifth St., s s, 100′ e Washington Ave., 3 two-st'y frame dwells., tin roofs; cost, each, $2,500; owner, Angus MacIntosh, High Bridge; architect, Joseph Kirby;

South St., part of piers 32 and 33, East River, and the bulkhead bet. said piers, one-st'y and part two-st'y frame (covered with iron) freight-shed, gravel roof; cost, $22,000; lessee, The Long Island R. R. Co., J. R. Maxwell, vice president, 115 Broadway, architect, Anthony Jones.

One Hundred and Twenty-second St., n s, 250′ w Seventh Ave., 2 three-st'y brick and stone dwells., tin roofs; cost, each, $8,000; owner, Phebe Smith, 1475 Broadway; architect, Geo. B. Pelham.

Elm St., No. 55, five-st'y brick factory, tin roof; cost, $14,000; owners, Radway & Co., 32 Warren St.; architect, Wm. Pistor.

Philadelphia.

Building Permits. — *Columbus Ave.*, n s, bet. Fifth and Sixth Sts., one-st'y store, 12′ x 44′; H. M. Martin, owner.

Wallace St., No. 1811, five-st'y building, 17′ x 78′; Jas. P. Doyle, contractor.

Pechin St., above Shurs Lane, 2 two-st'y dwells., 16′ x 42′; Wm. Raynor, owner.

Frankford Ave., No. 2924, two-st'y store, 18′ x 30′; George Kessler, contractor.

Queen St., s of Laurence St., three-st'y dwell., 20′ x 45′; Jno. Durkin, owner.

Brown St., bet. Delaware Ave. and Front St., two-st'y stable, 27′ x 68′; R. C. Ballinger, owner.

School St., e of Ridge Ave., 2 stables, 32′ x 58′; Geo. Wood, contractor.

Ludwig St., bet. Haverford and Lancaster Aves., two-st'y dwell., 14′ x 28′; J. Hayes, owner.

Ridge Ave., bet. Twenty-seventh St. and Berks Hall, triangular shape, 40′ x 57′ x 64′; Jno. F. Betz, owner; Wm. Gelte, architect.

Fourth St., between Brown and Poplar Sts., ice-house, 20′ x 82′; Jas. P. Doyle, contractor.

Columbia Ave., between Carlisle and Fifteenth Sts., one-st'y marble-shop, 24′ x 25′; Chas. Dading, owner.

Nice St., below Baker St., two-st'y dwell., 16′ x 30′; McLaughlin & McNamara, contractors.

No change in the quotations this week.

St. Louis.

Building Permits. — Fifty-two permits have been issued since our last report, nineteen of which are for unimportant frame houses. Of the rest, those worth $2,500 and over are as follows: —

John Schumacher, two-st'y brick dwell.; cost, $3,000; J. Schumacher, contractor.

C. B. Clark, three-st'y warehouse; cost, $9,000; sub-let.

C. G. Stifel Brewing Co., three-st'y machine-house; cost, $20,000; E. Jungenfeld (dead), architect; sub-let.

Frank Raffle, two-st'y brick store and tenement; cost, $5,000; sub-let.

D. M. Osborne & Co., four-st'y brick warehouse; cost, $25,000; sub-let.

F. W. Wesseler, two-st'y dwell.; cost, $5,000; A. Whri, contractor.

Henry Wanschaffe, two-st'y dwell.; cost, $3,300; Hy. Wanschaffe, contractor.

J. Billmeyer, two-st'y stores and dwells.; cost, $4,000; Henry Hagen, contractor.

Hugh Brennar & Son, two-st'y dwell.; cost, $4,000; D. J. Dempsey, contractor.

COMPETITION.

CHAMBER OF COMMERCE BUILDING.
[At Cincinnati, O.]

The Cincinnati Chamber of Commerce contemplates the erection of a new building, and invites designs from architects.

Circulars can be obtained on application to the Clerk of the Board.

471 GEORGE S. BRADBURY, Clerk.

COURT-HOUSE.
[At Toronto, Can.]

Toronto, December 23, 1884.

Designs, in competition for a court-house, to be erected on Queen St., at the head of Bay St., in the City of Toronto, will be received by the Court-House Committee of the City Council **up to noon of Wednesday, the 23d day of March, 1885.**

Premiums will be awarded as follows: "First prize the carrying out of the works as set forth in the instructions; second, $500; third, $400; fourth, $200."

All further information can be had on application at the City Clerk's Office, City-Hall Buildings, Toronto.

DAVID WALKER,
Chairman Court-House Committee.